

The Mining Journal

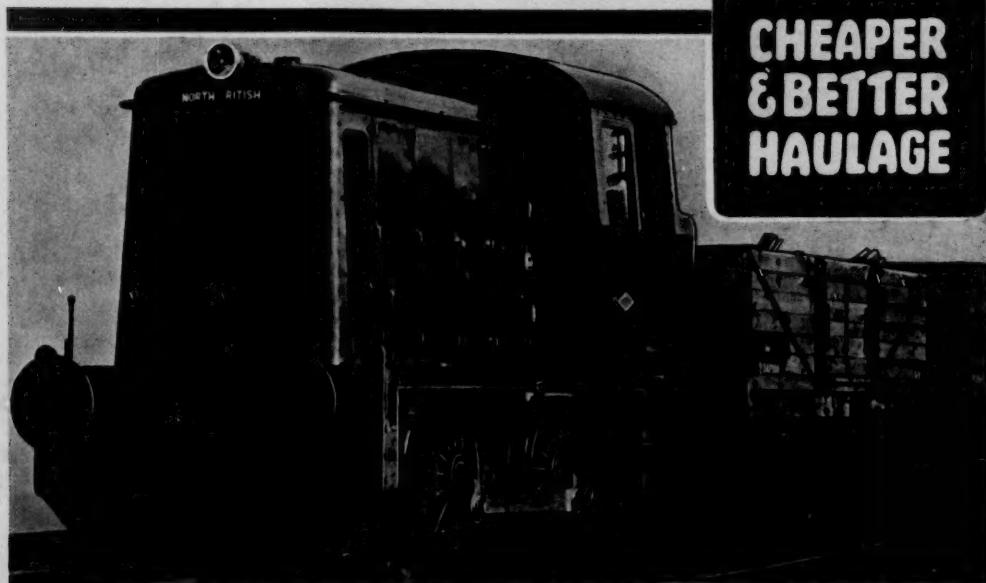
Established 1835

Railway & Commercial Gazette

Vol. CCXXXVIII No. 6083

LONDON, MARCH 21, 1953

PRICE 6d



NORTH BRITISH DIESEL SHUNTERS

THE NORTH BRITISH DIESEL INDUSTRIAL SHUNTER embodies the all-fluid Voith-North British Turbo-Transmission with all its unique advantages—no clutch, manual or automatic; no gear changing, driving by throttle control only; smooth starting, less wheel slip, steady acceleration and no engine stalling. As there is no mechanical connection between driving and driven parts, shock loads cannot be transmitted to the engine. Wear in the hydraulic transmission is negligible.

The oil requires periodical renewal and an overhaul examination can be carried out by a normal engine maintenance staff—no specialist knowledge required. Add to these features the fact that the Diesel Shunter is itself robust and simple in construction and accessible in design and it is apparent that the maintenance costs are exceptionally economical.

Descriptive literature sent on request

NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, GLASGOW, N.

Range of Standard Diesel SHUNTING LOCOMOTIVES STANDARD AND BROAD GAUGE

Horse Power	Type	Weight Variations	Max. Tractive Effort Variation
200	0-4-0	27-33 tons	18,000-22,000 lbs.
300	0-4-0	33-40 tons	22,000-26,700 lbs.
300	0-6-0	36-44 tons	24,000-29,500 lbs.
400	0-6-0	44-52 tons	29,500-35,000 lbs.
500	0-6-0	50-58 tons	34,000-39,000 lbs.

NORTH BRITISH LOCOMOTIVE CO. LTD.

The **D.P.** Rotary Pneumatic**DRILLING MACHINE**

TYPE D.P. 21

Other D.P. equipment includes:

Automatic Valves
Ventilating Fans
Pneumatic Picks

ONE of the most remarkable machines introduced to the mining industry. It is used for boring shot-holes in coal and soft stone, and works on the rotary principle. Using compressed air, it is absolutely safe in operation, while its light weight and ease of handling, together with entire absence of recoil and vibration have made it deservedly popular with the men, it being preferred to the percussive type of drill. It is used in conjunction with special drilling bits which enable it to drill in practically any coal. A trial is recommended.

DP/11



dollery and palmer
LIMITED

38 Victoria Street, London, S.W.1

Telephone: ABBey 7166 (2 lines)

Telegrams: Deflection, Sowest, London

**WOLVERHAMPTON DIAMOND
DIE & TOOL Co. Ltd.**

BOARTS
and
**INDUSTRIAL
DIAMONDS**
Exporters

**11 HATTON GARDEN,
LONDON, E.C.1**

Telephone: **HOL**bern 3017 Cables: **Pardimon, London**

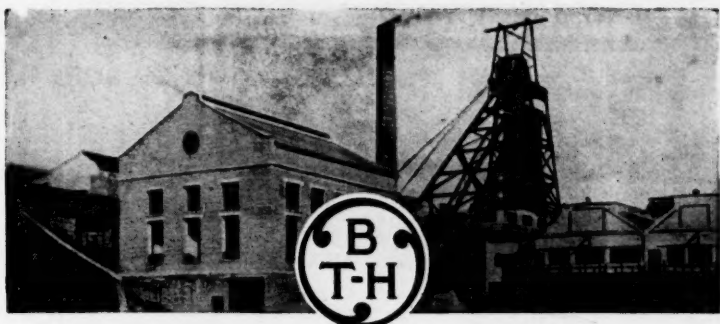
K. & B.

*Ore Testing and
Equipment of
Milling Plants*

**KNAPP & BATES
LIMITED**

10, Gate St. Kingsway, London, W.C.2

Telephone: **CHA** 6770
Cables: **FLWSHEET, LONDON**

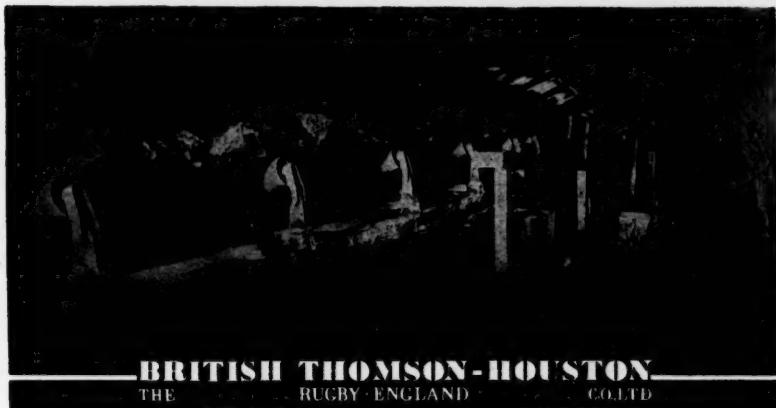


Electric Equipment for Mining

The products of The British Thomson-Houston Company enjoy an enviable world-wide reputation. Many factors have contributed to this position, such as excellence of design, robust construction, and consistency of quality; but of equal importance has been the careful study by BTH engineers of the requirements of particular industries. This applies especially to coal and metal mining. Since the beginning of the century BTH has been installing equipment in mines, and during the whole of this period has had free discussion and exchange of views with mining engineers the world over. It has thus helped to overcome problems arising from

the arduous conditions under which mining electrical apparatus has to operate. The Company has very extensive research, design and manufacturing resources, and produces a most comprehensive range of apparatus for mining, above and below ground, from the largest winders to the smallest motors and lighting equipment. It is, therefore, with the utmost confidence that the Company is taking a leading part in the supply of equipment for the schemes of reconstruction and modernization in progress not only in this country but in many other parts of the world.

... SPECIFY BTH EQUIPMENT



BRITISH THOMSON-HOUSTON
THE RUGBY-ENGLAND CO. LTD.

Member of the AEI group of companies

Principal Overseas Representatives:

AUSTRALIA, Sydney:
Australian General Electric
Proprietary Ltd., G.P.O.
Box 2517.

Melbourne: Australian
General Electric Proprietary
Ltd., G.P.O. Box
538F.

CHINA:

Hong Kong: Inniss & Rid-
die (China) Ltd., 1st Floor
David House, 67-69, Des
Voeux Road Central.

NEW ZEALAND, Wellin-
gton: National Electrical &
Engineering Co., Ltd.,
P.O. Box 1035.

INDIA: Associated Electri-
cal Industries (India) Ltd.,
Calcutta P.O. Box 271,
Bombay P.O. Box 484.

PAKISTAN: Associated
Electrical Industries (Paki-
stan) Ltd., Karachi P.O.
Box 746, Lahore P.O. Box
146.

SOUTH AFRICA,
Johannesburg: The British
Thomson Houston Co.,
(South Africa) (Pty), Ltd.,
P.O. Box 482.
Capetown: Wilson &
Herd Engineering (Pty.),
Ltd., P.O. Box 1459.

WEST AFRICA,
Takoradi, Gold Coast,
Colon: The West African
Engineering Co., P.O.
Box 100.

RHODESIA, Bulawayo:
Johnson & Fletcher, Ltd.,
P.O. Box 226.

KENYA COLONY,
A. Baumann & Co., Ltd.,
P.O. Box 538 Nairobi.

TANGANYIKA,
A. Baumann & Co., Ltd.,
P.O. Box 277 Dar-es-
Salaam.

UGANDA,
A. Baumann & Co., Ltd.,
P.O. Box 335 Kampala.

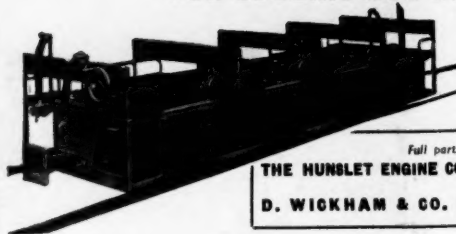
and others throughout the world

HUNSLET-WICKHAM MAN-RIDING CARS**FOR LOCOMOTIVE OR ROPE HAULAGE****CAPACITY**

24 men

STRENGTH

All steel.

EASY RIDINGSemi-elliptic springs.
Fixed axles.
Roller bearing wheels for
easy running round curves**SAFETY**Passengers inside car.
Westinghouse brakes and
hand screw brake.**ECONOMY**Low tare weight
giving max. payload.TARE WEIGHT (complete
with Westinghouse air-brake
gear and hand screw brake)**17½ cwt. (1,960 lb.)**

Full particulars from:

THE HUNSLET ENGINE CO. LTD., JACK LANE, LEEDS, ENG.
or
D. WICKHAM & CO. LTD., WARE, HERTS., ENG.**ABELSON & CO.
(ENGINEERS) LTD.**

Specialists in the supply of used and reconditioned plant and machinery including Tractors, Bulldozers, Scrapers, Excavators, Cranes, Locomotives, Rails, Wagons, Pumps, Compressors, Diesel Engines, Alternators, Motors, and all other types of plant used by Civil Engineers, Mining Engineers and Industrial Undertakings.

*Your enquiries are welcomed***Head Office:****Coventry Road, Sheldon, Birmingham**

Telephone: Sheldon 2424

Cables: Abelson Birmingham

London Office:**70, Victoria Street, London, S.W.1**

Telephone: Tate Gallery 9444-8

Manchester Office:**100, Oxford Road, Manchester, 13**

Telephone: Ardwick 1328

RUBBER LININGS**FOR ACID RESISTANCE**

ALL TYPES OF TANKS LINED
ON SITE WITH NORDAC ACID
RESISTING RUBBER.

RUBBER LINED PIPE INSTALL-
ATIONS SUPPLIED COMPLETE
WITH VALVES, PUMPS AND
FITTINGS.

NORDAC LIMITED

CHEMICAL ENGINEERS

**COWLEY MILL ROAD,
UXBRIDGE, MIDDLESEX.**

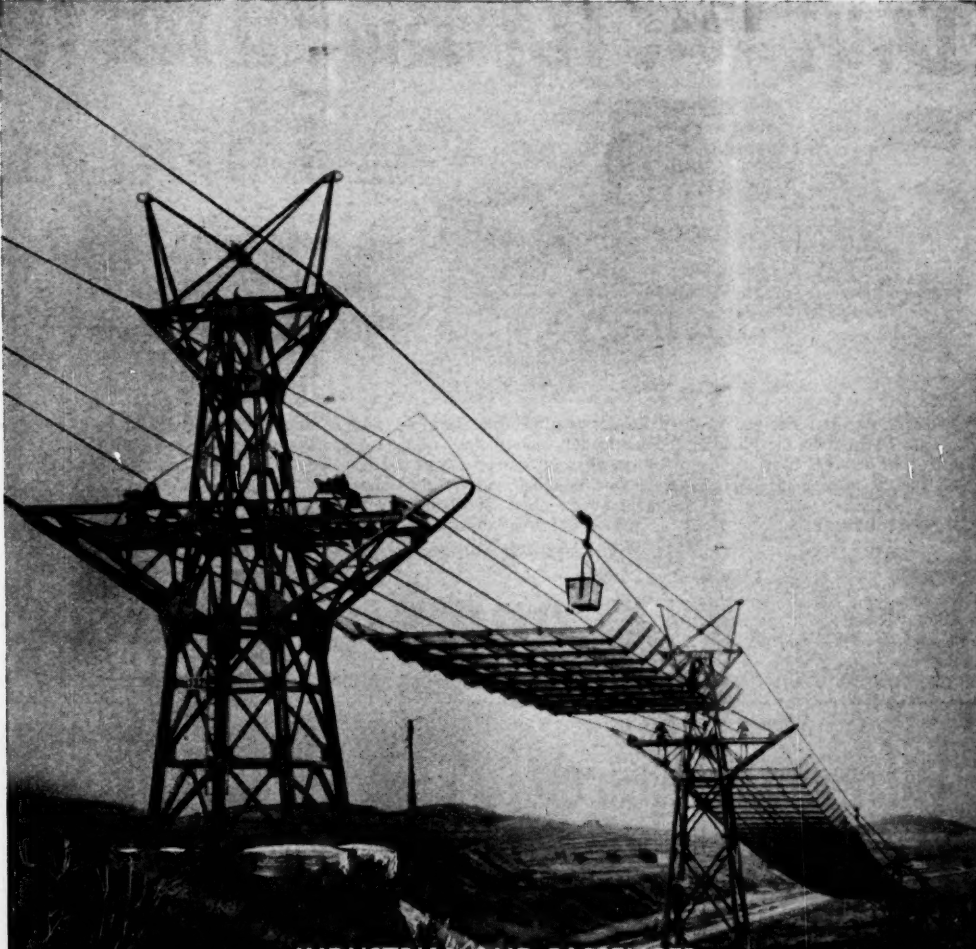
Telephone: UXBRIDGE 5131

WILFLEY**JAW CRUSHERS****BALL MILLS****CONCENTRATING TABLES****CENTRIFUGAL SAND PUMPS****MACE SMELTING FURNACES****MACE SINTERING HEARTHES****THE WILFLEY MINING MACHINERY CO. LTD.**

TELEPHONE MANSION HOUSE 1674

Salisbury House, London, E.C.2

TELEGRAMS "WRATHLESS, LONDON"



INDUSTRIAL AND PASSENGER

AERIAL ROPEWAYS

CABLEWAYS

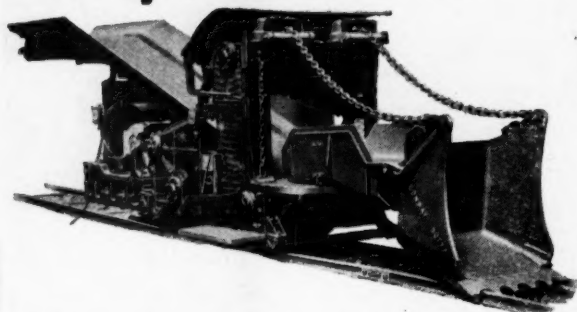
MANUFACTURED IN GREAT BRITAIN

CERETTI & TANFANI ROPEWAY CO. LTD.

IMPERIAL HOUSE, DOMINION STREET, LONDON, E.C.2

Telephone: CLerkenwell 1777 (8 lines) Telegrams: CERETANFA, LONDON

Drift Test It! Budget Test It!



Test Conway's Fast Loading cycle

Test Conway's Big Loading capacity

Test Conway's Low Cost mucking out

Whichever way you test the Conway Loader you will be convinced that it brings much needed economy to stone drifting. Watch it in the "heading." Four loading movements—tramming, rooting, swinging (55 degrees right or left), hoisting, all powered from one motor by one man in combination or independently. This singly controlled loading cycle gives biggest loading capacity and clears the "heading" without hand shovelling. Time it! A Conway Loaded out 38 yards of drift in 15 shifts at a Colliery in South Wales. When fitted with the Conway Clutch Operated Endless Belt Conveyor maximum loading capacity is obtained and drift tubs are charged at the rate of 130 tons and upwards per hour!

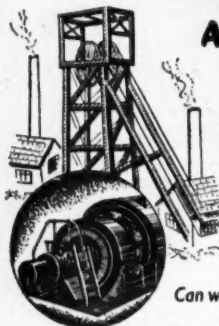
Write for Brochure describing complete Conway range

British Conway Loaders

BRITISH CONWAY LOADERS LTD., 3 CASTLE STREET, CARDIFF. Telephone: CARDIFF 8512 Telegrams: POWERSHOVL, CARDIFF

Wherever there's Mining machinery **CLEANING RAGS**

ARE VITAL.

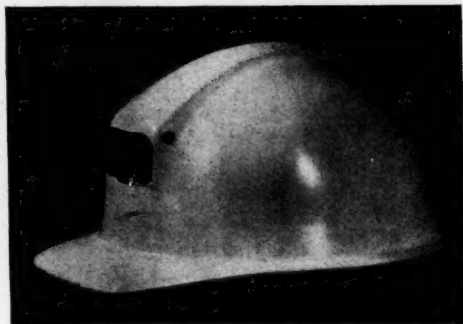


We supply Washed and Graded Cleaning and Polishing Rags, Cotton Waste, Stockinette, etc., for all types of machinery and allied purposes.

Can we quote for your requirements?

E. AUSTIN & SONS (LONDON) LTD.
ATLAS WHARF · HACKNEY WICK · LONDON, E.9

Telephone: AMHerst 2211



TOUGH and MOISTURE-PROOF

The special features of this helmet are toughness with complete resistance to moisture and high resistance to chemicals. The shape has been designed to give increased comfort and improved appearance. It is generally supplied in white, but it can also be finished in black. Lamp brackets are optional.

CROMWELL MINERS' HEADWEAR

Obtainable direct from:

HELMETS LIMITED, WHEATHAMPSTEAD, HERTS.

**“Work
this machine
faster — she’s
Automatically
Lubricated”**

Faster working! That means increased production ... greater ... much greater output. You *could* get the same results, of course, by working longer hours — but that puts up your costs. No, the solution is to install Tecalemit Centralised Lubrication — fully automatic, semi-automatic or manually operated — which feeds to every bearing the correct amount of oil or grease at the correct intervals of time. Machines can then be worked faster with complete safety; no overheating ... no breakdowns due to faulty lubrication...just smooth, untroubled running!



A Tecalemit Engineer is available to ‘talk lubrication’ with you at any time.

COMPLEX
AND LOW GRADE
MATERIALS*

*are treated on toll
or bought outright
by*

Capper Pass

* containing principally TIN and free from or combined with any of the metals Lead, Copper, Antimony, Bismuth and Silver.

Send samples to us at Bristol

CAPPER PASS
& SON LIMITED

BEDMINSTER SMELTING WORKS BRISTOL

The Mining Journal

Established 1835

Vol. CCXXXVIII No. 6083

LONDON, MARCH 21, 1954

Price 8d

CONTENTS

Notes and Comments	291
From Our Own Correspondent	
Australia	292
Canada	293
Application of Freezing Method to Quicksand in Potash Field	294
Correspondence	296
Mining in Spain	297
Reviews	298
Machinery & Equipment	299
VRI80—A New Force in the World of Earth Moving; Atlas Air Compressors, type CT.	

Metals, Minerals and Alloys	300
The Mining Markets	302
Company News and Views	303
International Nickel Has Another Record Year; Triefus Have a Good Year; Camp Bird's Jubilee Year.	
Company Shorts	303
Company Meetings and Announcements	304
Ariston Gold Mines; Gold Coast Main Reef; Hilger & Watts; Ashanti Goldfields Corporation; Bibiani (1927).	

Published by The Mining Journal Ltd. at 15, George Street, London, E.C.4.

Subscription £2 per annum (post free)

NOTES AND COMMENTS

The Australian Sulphur Industry

Superphosphate is a very important factor in Australian agriculture and the increasing demand for sulphur for sulphuric acid is a serious problem for superphosphate manufacturers, writes our Australian Correspondent. Requirements are met by imported brimstone and roaster gases from local zinc concentrate and pyrite, but restriction in import of brimstone is causing increasing attention to be given to the use of sulphide minerals produced in Australia.

At the present time, approximately one-third of the country's sulphur requirements is met by the roasting of zinc concentrate, or from pyrite concentrate produced from the complex lead-zinc-pyrite ores at Lake George Mines, of the copper ores of Mount Lyell and Mount Morgan Mines. The only company mining pyrite *per se*, and preparing it for the market, is Norseman Gold Mines, at Norseman, Western Australia. Broken Hill zinc concentrates are roasted at the acid plants at Port Pirie, Wallaroo, Birkenhead, South Australia, and at Cockle Creek, New South Wales, from which centres the calcine is shipped to the Electrolytic Zinc Company's works at Risdon, Tasmania. The Risdon works utilize zinc concentrate from that company's West Coast Mines for use in its manufacture of superphosphate for Tasmanian needs. Mount Morgan, Queensland, ships pyritic concentrate to superphosphate works at Brisbane, Queensland, and Port Kembla, New South Wales, the latter centre being also supplied with pyrite concentrate by the Lake George Mines. The largest producer of pyrite concentrate is the Mount Lyell Company in Tasmania, which supplies its own superphosphate works at Yarraville, Victoria.

Currently, shipping difficulties between Tasmania and the mainland have restricted deliveries, and the mine now has an accumulation of some 150,000 tons of concentrate, but with improvement in shipping, it is expected that consignments to the mainland will be about 80,000 tons of concentrate per year.

Western Australian requirements are met by the Norseman Gold Mines, where massive deposits of considerable

extent occur. The product is delivered partly as a flotation concentrate and partly as crushed ore. Output approximates 31,500 tons of concentrate, assaying 45.65 per cent sulphur and 11,600 tons crushed ore assaying 32.64 per cent sulphur. Ore as mined contains 25 per cent sulphur. Reserves of pyrite ore are 2,927,000 tons, and the company proposes to spend £A350,000 in their development and preparation. Costs on rail are 50s. per ton of concentrate, and net return is 2s. 8d. per unit on the mine. Other companies have their own individual terms for sale and delivery and it is not possible to arrive at a unit price other than for Norseman sulphur.

New developments in internal sulphur supply are the equipment and development of a large pyrite occurrence at Nairne, South Australia, in which the Broken Hill Proprietary Company is largely interested; production is planned at the rate of 71,500 tons of ore—mined by open cut—per year, the equivalent sulphur content being 31,700 tons. Production is expected in 1954. With improved transport facilities, Mount Lyell expects to deliver 80,000 tons of concentrate per year to the mainland. The extended project of Norseman Gold Mines aims at an equivalent sulphur production of 44,000 tons per year. At Port Pirie, South Australia, the new acid plant, using gases from the Dwight-Lloyd lead sintering plant, is expected to be in operation this year: these gases have, hitherto, not been utilized. Mount Morgan Mines, Queensland, where there are large quantities of pyrite in mill tailings dumps and in the ore reserves, have done much work investigating the recovery of elemental sulphur from pyrite, but with no great measure of economic success, and the immediate future increase of sulphur depends upon the marketing of a pyrite concentrate. At Risdon, Tasmania, a second unit has been added to the acid plant, and a third is planned, and at Cockle Creek, New South Wales, acid making capacity is to be increased, by a new plant of 25,000 tons acid capacity, using gases from the roasting of zinc concentrate. Pyrite deposits throughout the country are being examined, but most are small, and generally, the ores require concentration, while transport to centres of utilization imposes a heavy charge.

Yugoslavia to Mechanize Bauxite Mining

According to a report just to hand from Yugoslavia, an order for prospecting and mining equipment intended for the bauxite mines in Croatia has just been placed in West Germany, and it is expected that delivery will be made by the middle of this year at the latest. The Croatian bauxite deposits—the principal Yugoslav source of this ore—extend along almost the entire length of the Adriatic coast, and are considered to be the richest in Europe, having an aluminium content ranging from 50 to 60 per cent.

The mechanization of these mines forms part of a development programme the aim of which is to increase output of bauxite. In this connection, it is interesting to note that a large aluminium works is now under construction in Slovenia; it will be capable of handling half of the country's current bauxite production and will eventually make it possible to increase exports of aluminium.

Asbestos in South Africa—New Investment Corporation Formed

Since the increasing importance of asbestos mining in the economy of Southern Rhodesia was discussed in *The Mining Journal*, February 29, 1952, a report has emanated from the Office of the High Commissioner of South Africa announcing the establishment of an investment corporation, which will concentrate solely on the development of South African asbestos mines, and will have headquarters in Johannesburg. The corporation's capital of £750,000 has mainly been obtained overseas. The founders and shareholders are a series of factories in Switzerland, Belgium, France, Austria and Italy which manufacture asbestos products and which are co-operating with a similar undertaking in the Union. The corporation aims at buying its own mines or financing existing undertakings while selling the asbestos they produce through the new organization. The corporation will also give technical advice to the mines with which it reaches an agreement, and so help to build up the Union's asbestos production.

Australia's Oil-from-Coal Prospects

Australia can produce oil from coal for less than the cost of imported petrol—this conclusion has just been reached by an expert of Powell Duffryn Technical Services (London) who had been surveying prospects for this important industry. According to a report received from Sydney, this expert has stated that the Dominion had unlimited resources of "young" coal which are ideal for the production of motor spirit.

His Queensland survey showed that a £A.30,000,000 plant at Blair Athol could produce 300,000 tons of motor spirit a year, enough for between 70 and 80 per cent of the State's requirements. A check of production costs showed that the fuel could be produced for 10d. (Australian) a gallon, 25 to 33 per cent under the imported price of refined spirit. The heavy cost of transport could be overcome by a 650-mile pipeline to Brisbane, which would add only ½d. (Australian) a gallon to production costs. The octane value from Queensland deposits would be 80, compared with the 72 of imported spirit. He added that Victorian brown coal was also suitable for oil production.

There is hardly any need to stress the economic significance to Australia of oil-from-coal plants, the most important by-product of which would be fertiliser, one of Australia's big import items. It may be recalled that South Africa is making considerable progress with its oil-from-coal project and no doubt a decision to establish such a plant in Australia would similarly result in a further diversification of her economy.

Australia

(From Our Own Correspondent)

Melbourne, February 29

Australian zinc producing companies continue to operate under heavy financial disability through the compulsion to supply the local market at a fixed price of £A65 per ton. This condition was imposed during the war, when for a number of years the local price was £A22 per ton, which was much below the cost of production. Since the close of the war there have been two upward revisions, but while the present price rather more than covers costs, it does not give much margin of profit when compared with the overseas price. Consequently, the price restriction on local sales is costing the producing companies a large sum of money, and these companies are actually subsidizing the secondary zinc-using industries very heavily. Using figures for 1950, the Australian production of refined zinc was 83,652 tons, and domestic sales amounted to 50,150 tons leaving 33,502 tons on which the overseas price could be obtained. During 1950, the overseas price for zinc rose to £151 per ton, so the incidence of the pegged price for local sales can be readily appreciated.

Over the period covered above, Australian producers of other metals have been similarly penalised in the interest of secondary industry, metals which have been similarly affected being lead, tin, antimony, and to a lesser degree, copper, the price for which was much closer to world parity. Actually, the only metal of importance for which the benefit of world parity can be obtained is tungsten. This policy of pegged prices for local sales, together with taxation of the mining industry, followed by taxation of dividends therefrom, in the hands of shareholders, has been a serious retarding factor in the development of the mining industry, which is already heavily handicapped by shortage of labour and the high level of all costs.

UNION'S OPPOSITION TO POWER STOWAGE

Prominence is being given to power stowage as a factor in the mechanical working of pillars. Use of machines in the extraction of pillars has been strenuously opposed by the Miners' Federation. The opposition is based on the question of safety, notwithstanding mining practice overseas. Actually, resistance to mechanical mining of pillars is the last ditch in the long fight of the unions against the mechanization of collieries; further, the question of money is involved, for there is no union objection to working pillar coal by hand methods at very high rates of pay. It appears likely that opposition will be withdrawn if power stowage is used in mechanical working of pillars, and it, therefore, seems that this innovation is merely a concession to overcome the deadlock. Examination of mines in the thick Greta seam—with coal up to 26 ft. thick—shows the roof in the pillar areas standing well with no crushing of props for a considerable distance back from pillars in course of removal by hand mining. In a thinner seam, pillars were mined mechanically in one mine for a considerable time before the fact was realized, and union action taken. Engineers are by no means convinced that stowage is necessary in this work. Much work has, however, been carried out by the Joint Coal Board in power stowage, for it is recognized that machines cannot be employed efficiently in a mine unless they are also used in pillar extraction. Eight mines in the Cessnock district, working the thick Greta seam, have been selected for power stowage with the object of mining 290,000 tons of gas coal locked up in pillars by the union ban and it is hoped to obtain the co-operation of the miners because the issue is becoming increasingly urgent. It is foreseen that the introduction

of machines into pillar mining—with or without stowage—will involve demands for increased wages by special rates of pay, and this situation will have to be met, which no doubt it could be, profitably, if maximum output could be obtained in return for the rates paid. Meantime, success of the stowage experiments has a very important bearing on the future of many important collieries.

MORE MECHANIZATION—LESS OUTPUT

A most serious aspect is the steady decrease in output per total man-shift accompanying the extension of mechanization. In the hand labour days, output was as high as 3.6 tons per total manshift, but now with about 38 per cent mechanization, output has fallen to 2.96 tons per man-shift, through curtailment of effort. This curtailment, plus loss through strikes, can be assessed from the fact that during the week ended December 15, the New South Wales fields, with Christmas pay in view, produced 375,000 tons of black coal, equivalent to 18,000,000 tons for a 48 week year; yet the full year's figures give a total of 13,500,000 tons, including open cut coal.

During the year there were 940 strikes, or 34 per cent more than in the previous year, with a tendency for more prolonged strikes, but of the total, 78.6 per cent were one-day strikes. Loss of coal through strikes amounted to 42 tons per employee. A union representative has stated that improved conditions would result in increased production; yet the Joint Coal Board has spent very large sums upon improving conditions on the coalfields, but despite this, and extension of mechanization, production continues to fall, thus effectively disposing of this contention. Actually, conditions throughout the industry are good, and much superior to those in a number of surface industries which carry on relatively peacefully.

Canada

(From Our Own Correspondent)

Sudbury, March 8

A movement is under way in the province of Ontario designed to either enforce development of dormant mining claims, or compel the holders to relinquish ownership so that title may revert to the province and thereby become "open" territory for exploration and development by prospectors. Heretofore, the procedure has been to stake out mining claims, perform assessment work each year for a period of five years, pay for a patent, and hold title indefinitely—with the only continuing liability being an annual tax of just a few cents per acre. As a consequence, mining companies and speculators have been able to acquire such lands and hold them in idleness pending exhaustion of mines which they already have under operation, or to gain a free ride to fortune by letting others carry on work in the neighbourhood and thus enhance the value of idle holdings. Prospectors declare there are areas of great potential mineral value lying "as dead as a door nail" which the holders should be compelled to either work or forfeit. Either that, or obliged to pay a greatly increased annual acreage tax—a tax which would be big enough to pave the way for roadways and other developments designed to bring the area into productivity.

The opinion is expressed that the Ontario Government has it within its power to enact such a law, and that, in the event of doing so, a new wave of activity would quickly materialize in vast, silent, areas of woodlands and rocks where stagnation now reigns. It is possible that some claimholders would prefer to forfeit their title rather than pay a high acreage tax or carry on development. The benefit in such cases would be that the territory involved would be laid open to the searching eyes of prospectors once again and with the likelihood of making new mineral discoveries of value.

Gold producers in Canada are receiving a lower price for their product than for many years in the past. This has been brought about by the rise in value of Canadian funds. At the close of the first week in March, the Canadian currency has risen to a slight premium above the American dollar. The cost of mining an ounce of gold is higher than ever before.

Iron ore so far proven in northern Quebec and Labrador is 418,000,000 tons, containing upwards of 55 per cent. The development is still considered to be in its initial stage.

THE OIL BOOM GOES ON

With the search for petroleum now spreading into four of Canada's western provinces, the outlook is that expenditure on exploration alone will soon reach a rate of \$1,000,000 per day. At first, developments centred in the province of Alberta, and extended hesitantly into the edge of the adjoining province of Saskatchewan. Now the drilling rigs are at work at different points across the entire breadth of the two provinces from east to west—and with a vanguard reaching westward into British Columbia and eastward into Manitoba. Where only a dozen drilling rigs were at work a few years ago, there are now about 240. Where settlers once took up free homesteads of 160 acres of prairie land, sales of mineral rights have reached as high as \$1,850,000 for 160 acres. Seismographs, magnetometers, gravity meters, etc., are being employed with increasing skill and efficiency where leases and reservations already embrace nearly 100,000,000 acres. Flanking all this activity in Alberta, Saskatchewan, Manitoba and British Columbia on the north is the Northwest Territories, itself greater in extent than the combined area of the four provinces. In the Northwest Territories lie the MacMurray tar sands deposits, estimated by engineers to contain from 100,000,000,000 to 300,000,000,000 barrels of heavy bitumen. These tar sands are recognized as the world's largest reserve of petroleum, but remain for the present an open challenge to the ingenuity of man to find a practical method of separation. Meanwhile, although this deposit of tar sands may be of incalculable value in the future, yet it is through the drilling rigs and the gushers of the present that the flame of enthusiasm is being fed.

EXPANSION OF FALCONBRIDGE MINES

United States government agencies have made arrangements to advance \$6,000,000 to Falconbridge Nickel Mines. This is to pay for part of the programme of expansion in progress on the Falconbridge mines in the Sudbury district. This involves a guarantee on the part of Falconbridge to establish a minimum output of 35,000,000 lb. of nickel annually, together with a considerable production of cobalt. The Defence Materials Production Administration of the United States undertakes to purchase 50,000,000 lb. of nickel and up to 1,500,000 lb. of cobalt over a period of nine years. In addition, Falconbridge has the option to supply a further 25,000,000 lb. of nickel and 25,000,000 lb. of copper if it so desires. The price of nickel is geared to the current quotation of \$6.66c. per lb., copper at 19c. per lb. and cobalt at a minimum of \$1.80 per lb.

The Aluminum Co. of Canada is making good progress with its new project at Kitimat in British Columbia. In driving the 30 ft. x 30 ft. tunnel into the mountain some 400 ft., much loose rock structure was encountered. Accordingly, this drive was extended to 1,400 ft., and it is here beneath the mountain where the powerhouse will be established. At full-scale operation the 16 waterwheels to be installed will produce 1,600,000 h.p. continuously. All other phases of the new enterprise are progressing satisfactorily. Expenditures to date exceed \$50,000,000, and with the initial programme little more than 25 per cent complete.

Application of Freezing Method to Quicksand in Potash Field

By RUSSELL G. HAWORTH, Resident Manager of Potash Co. of America, Carlsbad, New Mexico.

The following article—which is a reprint of a paper presented by the author at the 1951 American Mining Congress—describes how considerable difficulties encountered in shaft sinking in water bearing sand were overcome by freezing, which the author considers to be the only successful method for combating highly fluid quicksands which cannot be grouted. Details are also given of the drilling methods used (which differed in several respects from those in this country and Europe), of the refrigeration plant employed, and of the design of the shaft.

The Potash Company of America operates a mine and refinery approximately 20 miles east of Carlsbad, New Mexico. Initial development consisted of two shafts (No. 1 and No. 2) sunk in 1934 and 1936. Neither of these shafts encountered flowing quicksands, but it was found necessary to use concrete lining in all but a small portion of the section above the salt, a distance of approximately 400 ft. Both shafts were difficult to sink due to several zones of sandy material and heavy flows of water, up to 900 g.p.m., in limestone, dolomite and gypsum formations. There is no outlet for surface drainage in the area and all rainfall that



Frozen quicksand in solution channel in gypsum formation

does not evaporate, descends through sinkholes and various channels to limestone, at a depth from 300 ft. to 350 ft. The lower limestone, the Culebra of Permian age, is the aquifer which apparently drains the excess water from the area. The water level in the basin formed by surface topography stands at approximately 50 ft.

In September 1947, No. 3 shaft was started approximately two miles north of the two original shafts and No. 4 shaft, two miles south, was started a month later. One test hole had been drilled within 150 ft. of each shaft and this work indicated that, in general, sinking could be done under approximately the same conditions as the first two shafts. Plans were made to grout water bearing zones, ahead of sinking, from the bottom of the shafts in order to eliminate pumping large flows of water.

No. 3 shaft encountered a water bearing sand at 50 ft. Although it was not a flowing quicksand, many difficulties developed in supporting the concrete lining and work was suspended at 75 ft. Grouting was unsuccessful, having been attempted in the zone from 52 ft. to 70 ft. Approximately 1,000 sacks of cement were used under high pressure. The cement was forced outward through small water bearing channels along bedding planes in the sands. No consolidation of the sand was effected.

Crews were transferred to No. 4 shaft where cuttings and information from the test holes indicated good ground

for sinking. Gypsum and anhydrite beds, containing little water and one ten-ft. sandy bed, were shown in the test hole from 90 ft. to the limestones. As sinking progressed, small fissures with heavy flows of water were found at 100 ft. and these were grouted off. Below this point, the fissures were found to be filled with sand and it was necessary to wash out the sand before grouting. Finally, a large solution cavity, filled with flowing quicksand which gushed up through 2 in. jackhammer holes, was encountered at 125 ft. A test hole was drilled close to the shaft and cores were taken from the solid section. This test hole showed that solid, dry anhydrite could be expected below 180 ft. and that the cavity bottomed at 130 ft. Sinking was accomplished by first bleeding sand out of closely spaced drill holes which were capped with pipe and replacing the sand with grout. Work was very slow and expensive by this method and it was decided to suspend operations for further investigation. Use of sodium silicate had already been studied and tests made in the shaft showed that this method of consolidation was not satisfactory.

Freezing was considered the only feasible method of consolidation of the quicksands (see the illustration in the adjoining column) and the author spent several weeks in England, France and Belgium, visiting several shafts which were being sunk by the freezing method as well as others being sunk by grouting.

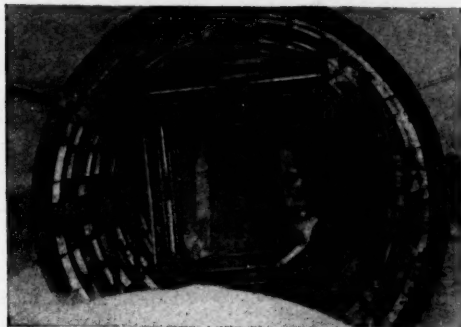
Further test work at No. 4 shaft showed that vertical sinkholes filled with quicksand existed along the south side of the shaft, although test holes on the north side were in dry anhydrite for much of the distance.

A decision was then made to find a new location. Several test holes were drilled and similar conditions were found to exist. The South Shaft was located near a large sinkhole appearing on the surface, but a ring of test holes around the shaft site indicated that relatively small solution cavities containing quicksand would be encountered. Special tests were made in churn drill test holes to determine water flows at various horizons. Data from these tests, as well as from cores from other test holes, led to the conclusion that the safest method as well as the cheapest would be to freeze the shaft zone before sinking.

DRILLING METHODS USED

Methods ultimately adopted in drilling freeze holes and in lining the frozen ground differed in several respects from that in use in Europe and England. At the South Shaft, holes 8 in. in diameter were drilled on the circumference of a 31 ft. diameter circle around the centre of the shaft location. Holes were spaced 3 ft. 5½ in. apart centre to centre. Twenty-eight holes were drilled to a depth of approximately 360 ft., just below the deepest water bearing formation which was an unconsolidated sand and silt, 40 ft. thick and containing a flow of water in the lower 2 ft. to 4 ft. In drilling test holes, with a churn drill, the water rose in the hole from the water horizon, causing the entire 40 ft. to cave.

Churn drills were not successful in drilling straight holes in the formation in question. Rotary drills were more successful, but much care was required in surveying the holes and it was necessary to drill slowly in order to drill straight holes. Each hole was checked each 50 ft. by an instrument which indicated the amount of deflection but not the direction. A single string of 6 in. casing was run in each hole. This string was welded and the bottom was



A view looking down in the shaft, showing the sectional steel forms in place, ready for pouring 25 ft. of concrete shaft lining

sealed with a welded plate. None of the casing was cemented. Two-in. pipe was run inside the 6 in. casing. A hole was drilled in the centre of the shaft to take 6 in. casing in which a number of slots were cut to provide openings at every point.

REFRIGERATION PLANT AND FREEZING

The refrigeration plant consisted of two ammonia compressors driven by 100 h.p., 2,300 volt motors. Heat of compression was removed in a small cooling tower and the condensed ammonia collected in a small tank. A shell and tube brine cooler was provided, where the evaporating ammonia cooled the brine circulated through the cooler. The brine was a CaCl_2 brine (1.26 Sp.gr.) and it was pumped by either of two 1,000 g.p.m. centrifugal pumps with 50 h.p. motors to the brine header.

The tube in each freeze hole was connected to the brine header which consisted of an 8 in. pipe ring outside the circumference of the ring of drill holes. These tubes were provided with valves to regulate rate of flow of brine in each hole so that the temperatures of the return brine from all holes could be adjusted to approximately the same reading. These pipes passed through a seal over the top of each outer 6 in. casing. The cold brine passed rapidly down the small tubing, returning at a slower rate through the 6 in. casing. This was done to obtain a cold brine at the bottom of the hole and to reduce rate of heat exchange between the two columns of brine. Control was established by regulating valves on the 2 in. brine inlet pipe so as to obtain the same outlet temperatures on all holes and hence uniform ice formation. Return brine flowed from the 6 in. casing in each hole to a second 8 in. circular brine header from whence it was piped through the brine cooling system.

The refrigeration plant was placed in operation and seven days later brine temperatures, as indicated by thermocouples at the bottom of the holes, were 6°F. Thermocouples were also used at the top of the casing to record exit brine temperature from each hole.

Cylinders of ice formed outside the 6 in. pipes where water was present and complete closure of the ice shell

around the shaft was completed in 48 days from time of starting brine circulation. Closure was indicated by water forced upward in the perforated centre pipe from water bearing strata due to the ice wall moving inward. Since the water inside the ice shell was provided an exit through this centre hole, there was no heaving of the ground due to expansion in volume during formation of ice. Level of the shaft collar and casing was checked during this period and no ground movement was noted. It cannot be assumed that, in every case, the method used at the Potash Company of America shaft would assure protection from ground movement during freezing.

SHAFT DESIGN

Design of the shaft is not orthodox due to the fact that it is primarily a ventilation shaft with provision for handling upcast air in one compartment and downcast air in the other. This shaft is circular to provide maximum strength, and is 15 ft. in diameter inside. A continuous centre dividing wall of concrete will be provided to separate the two compartments. One important feature is the provision for separate 25 ft. concrete ring lining sections through the water bearing zone (see the illustration in the adjoining column). Each is self-supporting with a bearing hitch at the bottom of the section. Above this hitch, where the concrete was poured in contact with the frozen ground for a distance of four ft., is a section where corrugated roofing was used as a lining during sinking.

This feature maintained an air space between the concrete and the frozen ground to prevent possibility of freezing of the concrete, and provided openings for later grouting. It also served as temporary support for protection from any loose rock. A ring of nine evenly spaced grout pipes was set at every five-ft. elevation in the forms before pouring the concrete. Although temperature measurements in the ground and in the concrete indicated that it would have been possible to pour concrete against the frozen ground without danger of freezing, and although laboratory tests indicated that such was the case, it was thought safer to proceed as outlined. Recently, a very interesting German reference (Heise-Herbst-Fritzsche, *Bergbaukunde*, Vol. 2, seventh edition, pp. 247-258), has been found, where this subject is discussed. The conclusion



A view of the bearing set base ring form in place, showing expansion shield for dowels and the upper half of the vulcanized rubber water stop

reached was that a special type of concrete will reach 80 per cent of normal strength when poured against frozen ground. In Europe, most shafts, if not all, where freezing is employed, are lined with cast iron tubing and with a final grout seal after thawing is completed. The independent

25 ft. pours at the Potash Company of America were designed to solve the problem of ground movement during thawing. It was thought that, if any of the zones observed during sinking or freezing exhibited evidence of lifting due to expansion of the ice, the formations could then return to their original position without stressing the lining. At the top of each pour a pre-moulded material one-half-inch thick was provided for an expansion joint. Several joints were made with this material, but when no evidence of ground movement could be found, the joint was merely coated heavily with asphalt. A vulcanized rubber water seal was located in each joint. It consisted of a strip of rubber approximately nine in. in height which was set in the forms so that it was fastened into each pour. A hollow tubular section in the centre of the strip was located at the joint to allow for any expansion or contraction (see the illustration in col. 2 on the previous page).

Since no movement of the beds was noticeable, it was decided after sinking through the frozen zone to grout behind the rings before complete thawing of the ice wall. The ground was allowed to thaw back a few inches in most of the zones before grouting. This step assured setting of the grout without freezing, with a consequent maximum bond between the ground and the grout. Grout was prevented by the ice wall from flowing outward through fissures or cracks.

Some question remains regarding the success of the design in shafts where marked uplifting of the ground would occur during freezing with subsidence to original position upon thawing.

SINKING METHODS

Equipment and methods used during sinking were conventional for the most part. The sinking crew consisted of six men on each shift on the bottom of the shaft and a topplander and hoistman on the surface. Some mechanics were employed and one operator on each shift was required for operation of the refrigerating equipment. No shaft mucking device was used, partially due to the fact that a crew of the size mentioned was required for setting reinforcing steel, and forms and pouring concrete. The shaft will not be lined through the salt section, but upon completion of sinking a concrete divider wall for separation of upcast and downcast compartments will be completed from the 730 ft. level to the surface. Since there was no divider wall placed during sinking, a 13 ft. 6 in. crosshead was used with the guides on opposite sides of the shaft. The crosshead was made of aluminium to reduce the load on the sinking hoist which was rather small.

Rate of sinking and lining averaged 64 ft. per month through the frozen ground. There were no difficulties experienced in sinking.

CONCLUSIONS

Frozen quicksand in large solution cavities at 125 ft. as well as ice in fissures and cracks in the limestone, were duly observed and photographed. From previous experience in No. 4 shaft, it could be concluded that these cavities would have been extremely difficult to sink through by any other method apart from freezing.

A zone of sandy material, between 310 ft. and 350 ft., the lower portion of which was water bearing, gave no trouble, but this same zone had to be cased promptly to prevent caving where churn drills were used for drilling. Several comments in the form of a conclusion may be summarized as follows:

(a) Freezing was a markedly successful method in comparison with other methods tried in the same type of

ground. It is the only successful method for combating highly fluid quicksands which cannot be grouted.

(b) Churn drills with cable tools were not successful in drilling straight holes. Rotary tools were faster and drilled reasonably vertical holes. Frequent check surveys must be made during drilling for control. Directional surveys are advisable for a final check to make sure that a wide gap does not exist between any two holes.

(c) Circular cross section is preferable due to higher strength, especially when ground movement is likely to occur.

(d) One or more holes inside the shaft should be drilled to provide for expansion of freezing water trapped inside the ice ring.

(e) Expensive cast iron tubing is not necessarily required. Reinforced concrete lining is cheaper.

(f) Cost of freezing is not excessive and in ground where grouting is difficult due to clays or sands with water, it may be less expensive.

(g) Freezing provides a safe method of going through heavy and wet ground and if concrete lining is kept within 30 ft. of the bottom, danger of breaking of the ice wall is limited to the open section. This method appears safer than sinking through all of the frozen section with only a temporary lining, followed by lining with cast iron tubing or reinforced concrete from the bottom of the frozen zone to the top.

(h) Where no ground movement is found, it is considered preferable to grout between the partially thawed ground and the concrete ring before complete thawing. This prevents the possibility of lateral movement of large blocks, bringing a high pressure at one point on the circumference of the shaft as well as eliminating a period when full hydrostatic pressure would be exerted on the shaft wall. It is also possible to grout at low pressures, there being no necessity for overcoming the hydrostatic head of the water in the ground.

Correspondence

To the Editor, "Mining Journal."

Dear Sir,

I must thank Mr. Fern for his kind remarks concerning the paper on "Some Recent Developments in Shallow Bath Heavy Media Coal Washing Plant," which appeared in your issue of February 22.

The paper was intended to be a descriptive one outlining the more important features of the newer types of shallow bath heavy media coal washing plant and was not intended to be fully comprehensive on the question of magnetic recovery and magnetic control of flocculation and dispersion of magnetite suspensions. Such a subject would require a series of papers. No attempt was made to credit the original work in this field to anyone and I cannot agree that such suggestions were made in the paper. It was simply pointed out that Dr. Vogel had adopted this method, as many others have done, and for the benefit of readers a simple description of these processes, as they are more or less applied in the latest coal washing plants developed in America, was included.

Yours faithfully,

H. Y. ROBINSON.

University of Durham,
The University School of Mines,
King's College,
Newcastle Upon Tyne, 1.
10th March, 1952.

Mining in Spain

In view of the long-term trend in international demand and of Spanish industrialisation, there is little likelihood that Spain's mineral exports will regain the proportion and relative importance which they held in 1929. This is one of the many interesting points made in the Board of Trade Overseas Economic Survey, *Economic and Commercial Conditions in Spain*, recently published and to which we have added, where possible, the 1951 figures. It states that according to the calculations of the official Council of National Economy, the index figure for Spanish mineral production in 1949 was only 29 as compared with 100 for the base year 1929. This great contraction mainly took place in the years before the Civil War, the index for 1935 being 38.5. Since 1940, the index has fluctuated between 25 and 30. Not all phases of mining have been equally affected, but it may be said that the general decline was due primarily to the drop in international prices after 1929 and to the continued low level of demand thereafter. Mining ceased to be a profitable business so that, quite apart from the difficulties of importing equipment owing to the chronic shortage of foreign exchange, few enterprises have been able to set aside funds for the modernization of equipment or for development work. Many of the undertakings are small and primitive, and have a marginal existence, often closing down for long periods when production difficulties are too onerous or prices too low. In the meantime, many of the richer and more easily worked deposits have become exhausted, and the country is faced with the pressing need to make good the many years of failure to carry out proper development work.

IMMEDIATE CAUSES HAMPERING MINING INDUSTRY'S RECOVERY

The report—which is dated May, 1951—emphasizes that a larger and more efficient production at reasonable costs would permit of increased exports, which are badly needed to augment the country's slender foreign exchange earnings. Moreover, an appreciable increase in the production of many minerals is urgently needed to sustain the expansion of Spanish industry. While, therefore, mining activities in Spain contracted after 1919 owing to the slump in international demand, other reasons must be found for production lagging during the past few years far behind the combined needs of home and foreign markets. The more immediate causes hampering recovery have been the difficulty of attracting and retaining an adequate labour force; the low output per man, due to a variety of factors, including the deterioration in the standard of living; the lag in official peseta price increases for minerals in the face of mounting costs; and frequent electric power cuts which, in 1949, for example, reduced the operation of the iron ore mines in Vizcaya to four hours a day. In an effort to solve some of these problems, the Government has increased prices and wages, and approved the payment of output bonuses to workers and producers, but these awards were swallowed up by rising costs and increases in the cost-of-living. However, conditions improved considerably in 1951, when mineral output improved generally.

The Spanish Government has been active in stimulating or sponsoring investigations into the reserves of various minerals, and in one way or another, is endeavouring to foster the exploitation of hitherto unworked deposits or the re-opening of mines which have closed down. Materials declared to be of interest to national defence including copper, manganese, ferro-manganese, ferro-silicon,

zinc, tin, wolfram, aluminium, molybdenum and chrome-nickel, are subject to an indirect form of State control through the Consejo Ordenador de Minerales Especiales de Interés Militar.

SITUATION OF IRON ORE MINING INDUSTRY

The general decline in Spanish mineral production after 1929 is most strongly reflected in the output of iron ore which, for the past ten years or more, has fluctuated between two and two and a half million tons as compared with a production of approximately 6,500,000 tons in 1929. However, in recent years, efforts have been made to overcome the difficulties confronting the industry, and there has been a notable improvement since 1947, the total output in 1951, rising to some 3,250,000 tons.

Peninsular Spain is faced with a long-term problem due to the gradual exhaustion of the more easily worked haematite ("rubio") deposits in Vizcaya, on which the Spanish iron and steel industry, centred in Bilbao, has mainly been built. In 1947, a Commission was set up under official auspices to investigate iron ore reserves. It started work in Vizcaya, in which province five boreholes have been sunk, revealing the existence of some 15,000,000 tons of ore, chiefly carbonate. The survey continues, and while it is expected that more reserves will be discovered, it remains to be seen whether or not they can be worked economically. Thus, no great increase in the output of iron ore can be expected in the near future.

In view of the dwindling reserves, the export of Vizcayan iron ore is now virtually prohibited; and the Spanish iron and steel industry is increasing its consumption of high quality ore from Spanish Morocco, notably the Rif mines. However, mining in Spanish Morocco is also handicapped by a shortage of manpower and the need to resort increasingly to underground mining and, in spite of the efforts being made to overcome these difficulties, it is doubted if production of the Rif Mines, at present under 900,000 tons a year, can be increased much beyond an annual figure of 1,000,000 tons.

COAL OUTPUT INSUFFICIENT FOR INDUSTRIAL NEEDS

Production of coal, anthracite and lignite (in 1,000 tons) rose from 7,267 in 1935 to 11,967 in 1949, and 12,826 in 1951. However, in spite of this expansion since 1935, coal production which remained more or less stationary between 1946 and 1950—is lagging seriously behind the increasing industrial demand and the lack of sufficient coal of good quality is one of the principal factors hampering the recovery and development of Spain's economy.

Many sources refer hopefully to the development of new coal mines, particularly in Asturias. However, apart from the fact that such projects will take time and will be hampered by the shortage of labour and of equipment, any increase in this direction will to some extent be offset by the need to close down eventually many of the uneconomic mines at present being worked. Progress on the whole, therefore, is likely to be slow.

In the years immediately preceding the Civil War, production of pyrites, which had reached a peak of 4,200,000 tons in 1929, was running at somewhat over 2,000,000 tons. Since 1940, production has been at a much lower level, but there has been a slow upward trend in recent

years, which became more accentuated in 1950 when output totalled 1,464,000 tons, rising to 1,806,000 tons last year.

Prior to the Korean War, there had been some slackening of foreign demand, but from June, 1950, onwards, the general shortage of U.S. sulphur caused an increase in the demand for Spanish pyrites. Since there is every indication that this heightened demand will continue, the outlook for the industry is particularly hopeful. Unfortunately the mines have hitherto been handicapped by difficulties in obtaining import licences for the machinery needed for re-equipment. In the early part of 1951, however, the Spanish authorities announced a scheme whereby the mines would be able to utilize a certain proportion of their foreign exchange earnings for re-equipment purposes. Problems which still remain to be solved are a chronic manpower shortage and transport bottlenecks.

DEVELOPMENTS IN NON-FERROUS METALS

As regards non-ferrous metals, the Survey states that it is doubtful whether any very great increase of copper-ore production will be achieved, primarily owing to the exhaustion of the richer ores. (Production figures for 1948, 1949 and 1950 were 151,600 tons, 151,100 tons and 175,100 tons, respectively). Production of lead metal, over one-third of which comes from the province of Jaen, sank in 1948 to the lowest level ever recorded—24,266 tons. A readjustment of prices, both for exports and for home sales, together with the introduction of a bonus-on increased output led to an improvement in 1950 to 39,456 tons, and rose further last year to 40,811 tons, while the outlook for producers is considerably brighter than for many years past. Investigation of old and new deposits is being actively pursued throughout the country, and great hopes are entertained of production from the Sierra Almagrera mines (province of Almeria) which are being pumped and reconditioned under the auspices of the National Institute of Industry. Attention is also being given to the treatment of dumps, of which large tonnages exist after 80 years of intensive mining and which could yield considerable quantities of lead for some years to come. From 1946 onwards, the zinc industry has recovered steadily and output reached 111,069 tons of blende in 1951. Exports also recovered during 1950 when 81,600 tons (72 per cent of total output) of blende were shipped. The United States of America, France and Norway, in that order, were the principal buyers.

WOLFRAM PRODUCTION

Wolfram production figures are unreliable owing to the tendency, when prices are low, to store the product in the hope of a boom, but output in 1951 rose to 1,864 tons. The Spanish authorities have endeavoured to restrict the export of wolfram to importers abroad who can arrange the supply to Spain of other minerals and ferro-alloys which are in short supply. The mines are very poorly equipped, and since the business is highly speculative there is reluctance to invest in equipment.

The improvement which took place in the early part of the decade in manganese output fell off after 1946. Little or no development work is being done, and no serious investigations are being carried out anywhere. No new facts are given about Spain's mercury production but the Survey reveals that a new large and rich bauxite deposit is reported to have been found in the province of Lerida. Government sponsored plans envisage the eventual production of aluminium exclusively from Spanish ore, but this is very problematical on account of the low content of the ore and for the present, at least, aluminium production is still largely dependent on imports of calcined alumina from France. Production of bauxite totalled 12,667 tons in 1951.

REVIEWS

Statistical Summary of the Mineral Industry (Production, Import and Export) 1944-50.—Prepared by the Statistical Section of the Mineral Resources Division of Colonial Geological Surveys.—H.M.S.O. Pp. 342. Price £1 5s. 6d. (post free).

The latest edition of the *Statistical Summary of the Mineral Industry*—which has been described by the U.S. Bureau of Mines as representing an outstanding contribution that is not paralleled by any similar publication of other foreign government agencies—formerly published for the Imperial Institute, covers the important and interesting 7-year period from 1944 to 1950, at the same time retaining the improved format of its immediate predecessor issued last year. Its importance to all sections of the community interested in mineral and metal statistics needs no emphasis.

The present volume gives statistics of the production, imports and exports of over 50 minerals and metals. In the case of copper, lead, tin and zinc, tables are included showing the production of ore in terms of metal, in addition to smelter production, and the iron and steel section gives information on iron ore, pig-iron, including ferro-alloys and steel.

The import and export tables refer not only to the crude minerals and metals, but also to the chief semi-manufacturers and in some cases to the principal chemicals and their derivatives.

The Northern Miner Annual Review Number.—Published by *The Northern Miner*, 122, Richmond Street West, Toronto, 1, Canada. Pp. 160. Price 20c.

The *Northern Miner* estimates in its admirable Annual Review Number that Canada's total mineral output for 1951 exceeded \$1.2 billion. Much of the increase over last year's figure is due to higher prices, but volume is up substantially, too.

Every mining province and territory is sharing in this expanded mining activity. British Columbia is in the midst of its greatest base metal boom in many years; the Yukon is featured by the Mayo silver-lead camp, busier than ever before; Giant Yellowknife highlights the Territories; Alberta, long just an agricultural province, is becoming industrialized through its oil and natural gas; Saskatchewan is headed toward a place as one of the great uranium provinces of the world. Manitoba is growing again as a base metal producer and Ontario still leads in gold, nickel, copper, and iron. Quebec goes steadily forward with a diversified production that may before long rank as Canada's greatest. Nova Scotia will next year add lead and zinc to its production list, and Newfoundland is having its busiest year yet in exploration and development.

The South African Mining and Engineering Year Book, 1951-52.—Edited by S. R. Potter. Published by the South African Mining Journal Syndicate Ltd., 201-207, Jubilee House, Simmonds Street, Johannesburg. Pp. 626. Price 45s. (post free).

The present edition of this well-known *Year Book* (which incorporates *The Rhodesian Mining Year Book*) is one of the largest and most comprehensive volumes issued since its inception 39 years ago. It contains as usual full details of the companies operating in the mining, engineering and industrial fields and, through the courtesy of Mr. D. G. Malherbe, the Government Mining Engineer, it has now been possible to publish, under the heading, "What the Mines Buy," information on the purchases made by South African mines in 1950; ordinarily, it would only have been possible to include figures for 1949.

MACHINERY AND EQUIPMENT

VR 180—A New Force in the World of Earth Moving

"Britain's 180 h.p. answer to the world demand for faster earth moving" is how the new Vickers-Armstrong tractor powered by a 180 h.p. Rolls Royce oil engine known as the VR 180, is described in a fully illustrated brochure just published, by Jack Olding & Co. of Hatfield, Herts., who are its world wide distributors.

While the claim is a big one, indications are that it will be justified. The tractor's parents, Vickers-Armstrong and Rolls Royce, are both symbols of British engineering skill and enterprise, while its world wide distributors is the Jack Olding Organization whose long experience in maintaining, repairing and rebuilding track-type vehicles should ensure a service comparable with the efficiency and reliability of the machine itself. With such historical antecedents it did not, therefore, come as a surprise to learn that prototype and pre-production models of the VR 180 were subjected to the most gruelling field tests and wherever any feature of the design or any component of the power unit failed in any way to satisfy the extremely high standards demanded, they were discarded and replaced until the machine produced the performance required of it.

Thus, it is only after years of intensive work by designers, technicians and engineers alike that actual production of the tractor is to commence. This will begin at the end of next month and both tractor and ancillary equipment will be displayed at the B.I.F., Birmingham, from May 5 to May 16, 1952.

The rugged strength of the VR 180 is founded on its $\frac{1}{2}$ in. steel plate hull which is welded, stiffened and cross braced and carries the front suspension unit, engine, cooling system and entirely closes the sump and oil reservoir. The drawbar is secured to the rear of the hull and where attachment faces are provided for the arms of the dozer blade the hull is increased to over 2 in. thick.

One of the major factors which will aid the VR 180 in carving for itself a special niche in the earth-moving world is the increased power to weight ratio obtained (compared with any other tractor with a similar power output) from the super-charged Rolls-Royce oil engine which delivers 180 belt h.p. The constant-mesh gearbox with all helical gears is another important factor as is the fully articulated suspension system used—described as the most marked advance over ordinary crawler tractors. The essential feature of this springless articulated suspension system is that it enables the "reflexing" track to maintain full traction under all conditions.

This is achieved by fitting four large diameter track wheels on each side and linking them in two pairs. The forward pairs



The pre-production model of the Vickers VR 180 Tractor with VS 180 Scraper at work

of wheels are free to move laterally on the central pivot beneath the hull and radially on their own supports while the rear pairs of track wheels and sprocket assemblies oscillate radially only, their pivot centre being on the output drive shaft from the reduction gear. The result is that no matter what the nature of the ground over which the tractor is travelling a three-point suspension is maintained, the weight of the machine

being constantly distributed between the central pivot linking the forward track wheels on either side and the two rear track wheels and sprocket assemblies.

Much thought has also been given to the problem of maintenance and this task has been eased considerably by the use of self lubricated bearings, large clutch and brake surfaces, and by the adoption of unit construction. This type of construction enables an entire unit needing servicing to be removed and replaced by a similar complete unit from store.



The VR 180 Tractor with overhead cable operated dozer

While the foregoing has only picked out a few of the salient aspects of this new tractor it is perhaps sufficient to show that the VR 180—the first heavy track-type tractor to be produced in England—should be well able to hold its own amongst similar giant earth moving machines produced anywhere else in the world.

Abridged specifications are set out below:

Gear	At rated engine speed (m.p.h.) (f.p.m.)	At reduced speeds drawbar max. drawbar
First	... 2.18 192	pull (lb.) pull (lb.)
Second	... 3.25 286	26,100 29,500
Third	... 3.76 330	17,000 19,250
Fourth	... 5.60 492	14,500 16,400
Fifth	... 6.53 579	8,240 9,300
Sixth	... 9.73 856	6,720 7,600
Reverse	... 2.66 233	3,140 3,600
Reverse	... 4.58 403	
Reverse	... 7.98 702	

Atlas Air Compressors Type CT

The range of Type CT Air Compressors made by the Atlas Diesel Co. Ltd.—compact two-stage air compressors of completely air cooled design, which are particularly suitable for use in mines and quarries—are described in leaflet E.843, just issued.

These compressors are available in sizes to deliver 145 and 255 cu. ft. of free air per minute at 100 lb. per sq. in. pressure. They are designed with the cylinders in angle form in order to give the best possible balancing, and thus to reduce vibration to a minimum. The inter-cooler is cooled by a fan which is driven from the crank shaft by bevel gears. The crank shaft is carried in self-aligning roller main bearings; this results in a high degree of reliability and little need for maintenance work. For use in mines and quarries the compressors are usually mounted on steel underframes.

METALS, MINERALS AND ALLOYS

The general downtrend in Continental "grey" market prices continues, and is affecting not only lead, zinc and tin, but even copper buyers are showing increasing reserve. Nickel appears to be the principal exception to this general picture.

The easing of the position in many of the base metals has spread to Canada. *The Financial Post* states that although supplies are still not plentiful copper, lead, zinc and aluminium are not so scarce as a short while ago. The reason for this change round, is not so much an increase in supplies as a diminution in the domestic demand. Perhaps the largest change is that of copper. Canada is now able to export manufactured and semi-manufactured goods to the United States. The Canadians are, however, under no illusions about the permanence of this new trade.

Despite the customary and continuous public debate which surrounds the American iron and steel market, the long-term statistical position still does not emerge with any clarity. This is to some extent inevitable so long as controls remain in force to obscure the strength of the potential demand. Meanwhile there is no doubt that the immediate supply position continues to ease and N.P.A. has increased allocations for the second quarter of the year. However, the short-term position cannot be regarded as secure, so long as the impending steel-strike overhangs the market.

COPPER.—The Copper Institute has revised the figures relating to the production of crude copper in the U.S. during January; the new total is 83,192 tons, and compares with 80,223 tons in February. The production of refined copper shows an even greater difference between the two months; 85,979 tons in February against 100,269 in January. Domestic deliveries rose, however, from 103,430 tons to 104,795 tons. Stocks in the U.S. shaded from 60,836 tons at the end of January to 59,747 tons on February 29.

Copper production outside the U.S. also fell during February, presumably the result of the shorter month; the output of crude primary copper declined to 108,680 tons and of refined copper to 95,280 tons.

D.P.A. is aiming to provide 2,270,000 s.tons of refined copper from all sources by the beginning of 1955. This will be 239,000 s.tons more than in 1950.

LEAD.—The long-expected cut in the official price of lead has been announced. The reduction of £7 per ton brings the price down to £163, as compared with the peak price of £180 per ton. According to the Ministry of Materials, the lower price is possible because of a cut in the price payable to the Commonwealth producers. There is some doubt whether the new price will be sufficient to stimulate buying again.

When arranging the new price of lead, the Ministry also removed the restrictions on the amount of lead which may be purchased for consumption. Purchasers will now be limited only by the amounts required to meet orders.

Confirmation has come from the Ministry of Materials regarding the sale of further supplies of lead to the U.S. The amount concerned is 23,000 tons, bringing the total official sales up to 53,000 tons. Delivery is to be spread over five months. The Ministry has stated that the metal covered by the later contract will come from Australian, Mexican and Peruvian sources. When the earlier contract was signed, we pointed out here that the whole of the Canadian output was being earmarked for the four months' period of delivery, but that the Australian production could easily meet the demand of 20,000 tons in four months.

TIN.—The agreement between the U.S. and Indonesia is a compromise between the demands made by the two parties. The U.S. has gained its point in the matter of the price; it is to pay only \$1.18 per lb., f.o.b. (equal to \$1.21 delivered New York). The Indonesians, on the other hand, have been able to introduce some flexibility into the contract; the amount of tin to be sold is given as 18,000 tons p.a., but the Indonesians have the right to sell the Americans another 2,000 tons p.a. at the contract price if they so wish. They also have the right to reduce the quantity to 58 per cent of their total production; if production should fall below the annual rate of 31,000 tons p.a. The Indonesians have obtained the same concessions as

the U.K. regarding the prices paid to the other producers, but this right to obtain a higher price if the U.S. pays a higher price to any other nation is limited to the first year of the contract. That is to say, for the same period as binds the U.S. in the aluminium-tin-steel deal with the U.K. The term of contract is nominally for three years, but as the contract price of \$1.18 per lb. is fixed for only two years, and the price to be paid in the third year is subject to negotiation there appears to be a possibility of the contract ending after the second year. This agreement covers less tin than the contract which recently expired; the amount covered in that contract was 25,000 tons p.a. The conclusion of the pact with Indonesia makes the possibility of Bolivia or Belgium obtaining more favourable terms than \$1.18 recede, despite the concern exhibited by the Bolivian producers and their insistence on the costs of their production being higher than elsewhere. Dealing with the tin producers singly has obviously strengthened the hands of the U.S.

Mr. Hopkinson, the Secretary for Overseas Trade revealed in the House of Commons on Wednesday that rapid progress has been made with British tin shipments to the States under the tin-and-aluminium-for-steel agreement. Up to date 5,000 tons have been dispatched, and a further 3,000 tons are expected to be on their way by April 1. £2,500,000 has already been received against these shipments.

ZINC.—Anticipation of a lower zinc price is keeping buyers off the market to such an extent that the Ministry of Materials was left with a surplus during February. This excess was, of course, partly caused by the restrictions on the end-uses of zinc, and partly by consumers living on their stocks. For some time now the Continental price of zinc has been falling and U.K. consumers are looking for zinc to follow the example of lead.

According to American reports, some members of the copper-lead-zinc committee of the I.M.C. are in favour of omitting zinc from the list of allocations for the second quarter of the year. This seems to be over-optimistic, but some domestic relaxations might follow, if the Committee finds itself able, as rumoured, to allocate 20,000 tons of metal more than in the first quarter of the year.

N.P.A. has clarified the position regarding the allocations of zinc. Earlier reports had stated that users would receive monthly and quarterly quotas. It is now stated that the domestic consumer will continue to be on a monthly basis, and metal destined for export will be allocated quarterly. Allocations of zinc to the domestic user for April are expected to be little changed from those of March.

ALUMINIUM.—A vice-president of Aluminium Ltd. discounts the optimistic estimates reported here last week that all foreseeable needs should be met when the present programme of expanding the U.S. aluminium industry to a capacity of 1,500,000 tons is completed. He told an audience in Chicago that world civilian demand would rise, on a conservative reckoning, to 3,300,000 tons by 1960. After all the present production expansion programmes have been carried out, world output would, on his estimates, total only 2,700,000 tons.

Officials of N.P.A. estimate that the total supply of aluminium in 1952 will be 1,400,000 s.tons against 1,183,000 s.tons in 1951. Despite this increase, demand will, according to these officials, still outstrip supply.

MANGANESE.—The search for more manganese ore deposits continues. Bethlehem Steel has announced that it has representatives in South West Africa who will start searching next June for this metal, iron and nickel. The company has prospecting rights over six areas in the districts of Kaokoveld, Outjo, Windhoek, Swakopmund, Keetmanshoop and Bethanie. The programme at present covers three years.

MOLYBDENUM.—The Bureau of Mines reports an increase of 36 per cent in the U.S. domestic production of molybdenum concentrates during 1951; the quantities were 38,902,400 lb. against 28,480,000 lb. Consumption did not quite keep pace, the rise from 26,029,000 lb. to 33,691,000 lb. being an increase of roughly 30 per cent. Stocks held by industry at the year-end had jumped from 4,089,800 lb. to 5,067,700 lb.

The London Metal Market

(From Our Metal Exchange Correspondent)

The American Government has now concluded a three years contract with the Indonesians to purchase tin at a price of 118c. per lb. for the first two years, and a clause calling for a new price to be established for the last year; the tonnage involved is 18,000 tons a year, but with an option for the sellers to deliver in addition 2,000 tons annually. It is understood that the Belgians will sign a similar contract for 7,000 tons a year with an option to increase by 1,000 tons annually, and it is now expected that the Bolivians will have to fall in line as far as the price is concerned. When all these purchases are definite, it looks as if the U.S. will have sufficient tin available to relax some of the controls which limited the consumption during 1951 to approximate 57,000 tons, provided that none of the metal purchased is to be diverted into the stock-pile. There are no official figures covering either the stock-pile objective or the tonnage already collected, but it is safe to assume that an additional 75-100,000 tons are still required, and one is therefore justified in assuming that the surplus production during 1952 will find its way into the stock-pile provided the price is attractive to the R.F.C., and whether this price will have to be very much below 118c. per lb. f.o.b. is an interesting subject for speculation.

The sale of an additional 23,000 tons of lead to America by H.M. Government will help to diminish the rate of increase in the stocks of lead of the U.K., which rose from 77,000 tons at the end of December to 90,000 tons at the end of January, the Government holdings accounting for approximately the whole increase. The price in the U.K. has been reduced to £163 per ton, delivered, but it is feared that this will not bring any additional export business, as the Continental price is still between £155-£160 per ton.

The zinc and copper markets have been quiet with buyers continuing to hold off, but there are signs that sellers are not prepared to adjust their ideas of price too rapidly.

On Thursday the official close on the tin market was: Settlement price £974, Cash Buyers £974, Sellers £974 10s.; Three months' Buyers £975, Sellers £976. In the afternoon the market was steady. Turnover for the day was 120 tons. Approximate turnover for the week was 700 tons.

The Eastern price on Thursday morning was equivalent to £980 5s. per ton, c.i.f. Europe.

Iron and Steel

It is now manifest that all the iron and steel allocations issued for the first control period cannot be honoured before the end of the month. Authorizations appear to have been issued in excess of the capacity of the industry and there will be many disappointments when the first period ends on March 31.

Possibly a determination not to repeat the initial mistake of excessive allocations has influenced the authorities in adopting a parsimonious policy for the second quarter of the year. Certainly the restrictions are severe. Even the railways and collieries have had to share in the pinch. There is, however, hope of an early improvement which will narrow the gap between supply and demand.

The first consignments of the extra million tons of steel promised by the U.S.—"Churchill steel" as it has been called—have already arrived. More is on the way and unless the impact of the re-armament programme is more severe than is at present anticipated, the tonnages of steel available for distribution should have substantially increased by June at the latest. Alloy steel will be difficult because of the scarcity of chrome and other alloy metals, but if consumers of the ordinary grade of steel can tide over the next couple of months, the squeeze may be relaxed.

The domestic policy of the steel industry is to concentrate upon the rapid expansion of pig iron production. Completion of new coke ovens and blast furnaces is being speeded up, and in the meantime the possibilities of obtaining bigger outputs from the furnaces now in operation have not been exhausted. More pig iron is certainly needed. The iron foundries are constantly pressing for deliveries to maintain full production and the output of basic iron and steel falls short of the needs of the steel plants. The export of iron has virtually ceased, and in some cases very high prices have been paid for urgently needed tonnages of Continental pig iron.

MARCH 20 PRICES

COPPER

Electrolytic £227 0 0 d/d

TIN

(See our London Metal Exchange report for Thursday's prices)

LEAD

Soft foreign, duty paid £163 0 0 d/d
Soft empire, including secondary lead £163 0 0 d/d
English lead £164 10 0 d/d

ZINC

G.O.B. spelter, foreign, duty paid £190 0 0 d/d
G.O.B. spelter, domestic £190 0 0 d/d
Electrolytic and refined zinc £194 0 0 d/d

ANTIMONY

English (99%) delivered,
10 cwt. and over £340 per ton
Crude (70%) £275 per ton
Ore (60% basis) 40s./42s. 6d. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) £454 per ton

OTHER METALS

Aluminium, £148 per ton. Palladium, £8 10s. oz.
Bismuth, 28s. lb. Platinum (scrap), £33.
Cadmium, 18s. 9d. lb. Platinum, £27/33 5s. nom.
Chromium, 6s. 3d. lb. Rhodium, £45 oz.
Cobalt, 20s. lb. Ruthenium, £30 oz.
Gold, 248s. f.oz. Quicksilver, £73 10s./£74 ex-warehouse.
Iridium, £65 oz. nom. Selenium, 25s. nom. per lb.
Magnesium, 2s. 10½d. lb. Silver (bar), 77d. f.oz. spot and forward.
Osmiridium, £35 oz. nom. Tellurium, 19s. lb.
Osmium, £70 oz. nom.

ORES, ALLOYS, ETC.

Bismuth 60% 17s. lb. c.i.f.
50% 16s. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £13 per ton c.i.f.
" (concentrates) £13 per ton c.i.f.
" Refractory £12 12s. per ton c.i.f.
Baluchistan Metallurgical £14 16s. per ton c.i.f.
Magnesite, ground calcined ... £26 - £27 d/d
Magnesite, Raw ... £10 - £11 d/d
Molybdenite (85% basis) ... 103s. 1½d. per unit c.i.f.
Wolfram (65%), U.K. ... 485s. nom. c.i.f.
Tungsten Metal Powder ... 35s. nom. per lb. (home) (for steel manufacture)
Ferro-tungsten ... 33s. nom. per lb. (home)
Carbide, 4-cwt. lots ... £30 3s. 9d. d/d per ton
Ferro-manganese, home ... £43 15s. 2d. per ton
Brass Wire ... 2s. 7½d. per lb. basis.
Brass Tubes, solid drawn ... 2s. 1d. per lb. basis.

U.K. PRIMARY METAL STATISTICS—JANUARY (long tons)

	Refined Copper	Lead †	Slab Zinc	Tin Metal
Stocks in U.K. Jan. 1				
Government	58,608	53,362	26,340	200‡
Consumers	28,643	23,805	13,319	4,904
Imports	18,926	26,083	18,308	713
Production	12,491	5,933	4,841	2,873*
Consumption	31,613	17,888	18,812	2,287
Exports & Re-exports	70	78	15	276
Stocks U.K. Jan. 31†				
Government	59,175	68,101	30,052	200‡
Consumers	27,942	21,730	14,487	4,708

(Source: British Bureau of Non-Ferrous Metal Statistics)

* Estimated by International Tin Study Group.

† Includes imported virgin lead and English refined from domestic ores and from secondary metal.

‡ Excluding strategic reserves.

|| Including tin in official warehouses but excluding smelter carry over.

‡ In addition U.K. stocks of blister copper at the end of January were 19,773 tons; of zinc concentrates were 42,890 tons and of tin in ore were probably about 1,500 tons.

COMPANY NEWS AND VIEWS

International Nickel Has Another Record Year

To-day's nickel shortage can certainly not be attributed to any failure in production. This fact emerges clearly enough from International Nickel's report and accounts for 1951. Inco, which is responsible for producing around 90 per cent of the world's nickel, increased its mine output in 1951 to 11,799,320 stons compared with 9,849,024 tons in 1950. A breakdown of these figures indicates a relatively much larger increase in production from underground workings, 7,780,143 stons having been mined during the year compared with 5,733,269 in 1950. This is a measure of the progress made during the year in the company's programme for converting mining exclusively to underground operations, opencast production having remained little changed from 1950 at 4,019,177 tons. When the changeover has been completed, Inco expects to be able to hoist 13,000,000 tons of ore annually from underground and to dispense with opencast operations altogether.

Despite increased mine production, total deliveries of nickel at 243,865,030 lb. were about 12,500,000 lb. less than in 1950, the higher figure in this earlier year having been achieved by running down stocks. 1951 deliveries of copper and platinum were a record for any post-war year, copper being 11 per cent and the platinum metals over 40 per cent in advance of 1950.

Consolidated financial results for 1951 compared with 1950 were as follows:

	1951 U.S. \$	1950 U.S. \$
Net Sales	286,785,241	228,071,346
Other income	1,892,641	1,280,338
Costs and expenses	161,846,172	141,091,119
Depreciation and depletion provision	9,080,607	8,963,574
Retirement scheme and self-insurance	6,726,814	2,933,527
Provision for taxation	48,148,718	27,597,615
Net profit	62,815,571	48,765,849

Out of the net profit ordinary shareholders received dividends in 1951 totalling \$37,903,239 equivalent to \$2.60 per share against \$2 in 1950. Dividend payments on the preference stock were unchanged at \$1,933,899.

Trifels Have A Good Year

The group profits, before tax, for Trifels & Co. Ltd.—exporters of industrial diamonds—showed improvement during 1951 at £195,083 compared with £163,392 in 1950. Of this amount £115,382 will be required for tax, while £50,000 is being transferred to reserve. Dividend distribution for the year remains unchanged at 25 per cent on the preferred ordinary shares and 13 per cent on the ordinary shares. The annual meeting is on April 25.

Camp Bird's Jubilee Year

Although established fifty years ago to operate the Camp Bird gold mine in Colorado, Camp Bird Ltd., is to-day principally a mining finance company associated with the Consolidated Gold Fields group. Its world wide interests are mainly in gold mines, although its investment portfolio extends to base metals, platinum, diamonds, timber, and real estate.

Shareholders at the fiftieth annual general meeting to be held in London on April 29 will have a very satisfactory year's operations to consider. Profit for 1951 (at present subject to audit) was £93,493 as against £63,253 in 1950. This figure is arrived at after charging £100,979 (£69,380) for taxation, and transferring £65,000 (same) to investment reserve. Each year since the war this company has paid a 10 per cent dividend, a payment which is being repeated for 1951, although the successful results for the company's Jubilee year are being marked by a further special jubilee bonus of 2½ per cent, making the total distribution for the year 1s. 3d. for the 10s. share. This dividend payment will absorb £71,331 (as against £59,782) and

after transferring £25,000 (nil) to general reserve, the unappropriated carry forward is slightly reduced at £46,409 (£49,247).

The proposed dividend distribution may appear to some unduly conservative in the light of the year's extremely satisfactory results but no mining company can be blamed for caution at the present time while the exact implications of the excess profits levy are as yet unknown.

Company Shorts

Union Corporation Pays More.—Preliminary figures indicate that Union Corporation's net profit improved in 1951. After providing £1,153,000 for taxation there was a net profit of £982,714 as compared with £927,319 in 1950. This has enabled the directors to declare a final dividend of 4s. 6d. per share, making a total for the year of 6s. 6d. (against 6s. in 1950) equivalent to 52 per cent.

Ashanti's Reduced Dividend.—The preliminary figures for Ashanti Goldfields Corporation for the year to September 30, 1951, will prove a disappointment to many shareholders. Subject to audit, net profits after tax amount to £418,648 compared with £621,570. This sharp decline can be accounted for by the increased provision for taxation at £643,624 as compared with £449,825. This increase is presumably due to the decision to catch up with tax arrears foreshadowed at the last meeting. This tax increase should therefore be a non-recurring item although what the company's increased liability will be next year under E.P.L. remains to be seen. Meanwhile, the final dividend this year is 1s. per unit, making 2s. (50 per cent) as compared with 2s. 6d. (62½ per cent) for the previous year.

Bibiani Results.—Bibiani (1927) Ltd. also reports reduced net profits for 1951 at £103,119 compared with £159,558. In this case taxation is proportionately down at £86,743 as against £141,000. Including a final dividend of 6d. per unit, total distribution for the year to September 30, 1951, amounted to 10d. per share, equivalent to 20 5/6 per cent as against 25 per cent in the previous year.

Aluminium Ltd.—The increased provision for depreciation was largely responsible for the decline in the consolidated net profit of Aluminium Ltd. to \$28,800,000 in 1951, compared with \$32,600,000 in the previous year, states Mr. Nathaniel V. Davis, president, in a letter to shareholders. The amount provided for depreciation in 1951 totalled approximately \$21,000,000 compared with \$9,200,000 in the previous year.

British Malayan Tin Records Small Loss.—For the year ended June 30 last, British Malayan Tin Syndicate produced 80 tons of tin concentrates having an average value of 37.46 per cent tin metal, compared with 73 tons averaging 35.9 per cent tin metal in the preceding year. Although proceeds from the sales of this output advanced from £12,721 to £28,306, after providing for all expenses the year's operation resulted in a loss of £470. The annual meeting will be held in London on March 19. Mr. Charles Jackson is chairman.

Pahang Consolidated's War Damage Award.—The Pahang Consolidated Co. has received an award of £453,602 by the War Damage Commission. When paid, this award will be set off against the Malayan Government's advance to the company amounting to £432,873.

Siamese Tin's Kota Bahru Property.—Siamese Tin Syndicate announced that the dredge on the property of their wholly owned subsidiary at Kota Bahru, which sank on March 15 of last year, has now been repaired and re-floated and has been in full production since February 21. Full settlement of the insurance claim is expected to be effected within a week or so.

Anglo-Burma Tin Debentures.—A drawing of £7,850 six per cent registered debentures of Anglo-Burma Tin Co. will be made on March 26. Notices will be posted to drawn holders on or about March 28 and the drawn debentures will be repaid at par on June 30. The register of debentures will be closed for transfers from March 24 to March 29, both days inclusive.

The Drewry Car Company Ltd., formerly of 134, Chapside, London, E.C.2, announce that they are moving into new premises and, as from March 24, 1952, their address will be City Wall House, 129-139, Finsbury Pavement, London, E.C.2. Telephone Monarch 0671.

ARISTON GOLD MINES

RECORD TONNAGE AND REVENUE

The Twenty-second Annual General Meeting of Ariston Gold Mines (1929) Ltd. was held on March 18 in London, Major General W. W. Richards, C.B., C.B.E., M.C., Chairman of the company, presiding.

The following is an extract from the statement of the Chairman which was circulated with the report and accounts for the year ended September 30, 1951:—

PRODUCTION AND ORE RESERVES: 328,370 tons of ore of an average grade of 7.134 dwt. were milled during the year, against 293,000 tons of 7.564 dwt. grade milled from the previous year. In addition 5,402 tons accumulated concentrates were re-treated; 808 oz. of gold was produced from the special treatment of slags.

The total amount realized for the year was £1,327,446 against a total of £1,286,506 for 1950, an increase of £40,940. The ore reserves at September 30, 1951, were computed at 2,933,991 tons of an average value of 6.73 dwt., showing a decrease of 191,353 tons and an increase in value of 0.7 dwt. as compared with the preceding year's figures.

UNDERGROUND DEVELOPMENT

On the recommendation of the General Manager and the Technical Advisers, after a careful assessment of the company's ore reserves position in conjunction with the available supplies of labour and materials, it was decided to limit expenditure on development work to the exploration of the North Ore Body where development on the 24th Level has proved its downward extension with the consequent indication of a considerable further tonnage of payable ore. This is a development of major importance.

On the No. 2 Ore Body, the work on the 17th Level South Drive which crossed into the property of the Gold Coast Main Reef Ltd., produced negative results. The Gold Coast Main Reef Co. development to date on the 6th Level North has proved the existence of a body of ore averaging 5.29 dwt. over 51.7 in. for a distance of 132 ft. The face of the drive is at present about 857 ft. from our common boundary. This Ore Body may pitch into the Ariston ground below the 17th Level.

METALLURGICAL PLANT: Technical metallurgical difficulties during the year resulted in a reduced rate of recovery. An intensive period of research by the Metallurgical Department of our Technical Advisers has not only re-established good extraction results, but improved on former standards.

The tonnage sent to the mill from the mine is within the present 30,000 tons per month capacity of the plant. A final milling unit is now in course of shipment to bring the total milling capacity up to 40,000 tons per month. Delivery of the winding engine necessary for this higher milling rate is expected in approximately twelve months.

ACCOUNTS: The gross revenue at £1,327,446 is again a record, from the treatment of a record tonnage of 328,370 tons. Costs show a progressive increase at a total of £771,948 or 47s. per ton against £659,387 or 45s. per ton for the previous year, despite every effort made both technically and administratively to reduce expenditure wherever possible.

The net result of our operations is a profit of £332,424 before taxation, being a reduction of £163,281 against the previous year. Ore development redemption at £61,245 is £17,834 more than last year.

Although the company obtained some relief for taxation on the year's profits from initial allowances in respect of capital expenditure incurred during the year, the total charge for taxation (including Gold Duty) absorbed 62 per cent of the company's profits against 51 per cent in the previous year. The Gold Coast Government alone took some 38 per cent of the company's profits for Gold Coast income tax and Gold Duty, the total amount of which exceeds the distribution to members.

DIVIDENDS: In the Profit and Loss Appropriation Account, we have a total available for disposal of £240,548, out of which an interim dividend of 7½ per cent, less tax (2½d. per Unit), was paid on May 11 last. Your board now recommends for your approval and confirmation, the payment of a final dividend on account of the year ended September 30, 1951, of 17½ per cent, less tax (5½d. per Unit), making a total of 25 per cent (7½d. per Unit) for the year (less tax). Dividend warrants will be posted on April 10, 1952. The amount to be carried forward to the current year is £62,892.

CURRENT OPERATIONS: For the first four months of the current year, output has been maintained at a consistently higher level, total mine revenue being £477,980 and the total mine working profit £191,220. From the month of October, 1951, we have had the benefit of the permitted sale at a premium price of 40 per cent of our output. Sale of gold at premium prices has to date brought in an additional gross revenue of over £4,000 monthly.

The report and accounts were adopted.

GOLD COAST MAIN REEF

The Eighteenth Annual General Meeting of Gold Coast Main Reef Ltd., was held on March 17, in London.

Major General W. W. Richards, C.B., C.B.E., M.C., Chairman of the company, presided.

The following is an extract from the statement of the Chairman, which was circulated with the report and accounts for the year ended June 30, 1951:—

The financial year of the company which ended on June 30, 1951, was one of continued progress. The net profit, after writing off £24,109 for depreciation and £31,060 for development expenditure, amounted to £34,413, as compared with the previous year's net profit of £9,937.

We maintained the unbroken series of dividends since the year 1940-41 by the distribution of 5 per cent, less tax; and this has been followed very recently by an interim distribution of 5 per cent, less tax, for the current year ending on June 30, 1952.

Our mining activities extend over a length of four miles, from the Tuappim Mine at the south-western end of our concessions running through the Bondaye and Ekotokroo sections up to our common boundary with the Ariston Mine. We are, as is generally known, on the same line of quartz reef as Ariston, and it is very desirable that our two companies should work in the closest harmony to the best advantage of each. I am pleased to report that the liaison between the two mines has advanced quite materially since I last addressed you. This has permitted the introduction of various economies in administration, accounting, storekeeping and other services; including, of course, the great benefit of Mr. Clelland's joint management.

ORE RESERVES: It is satisfactory to record that after extracting and treating during the year a total of 93,609 tons, the reserves showed a net increase of 21,005 tons at the end of the year; aggregating 387,606 tons, averaging 8.93 dwt. per ton over a width of 63 in.

A welcome announcement was made by the Gold Coast Government towards the end of October, 1951. It was to the effect that commencing with production of gold as and from October 1, 1951, producers were authorized to sell 40 per cent of their gold output on the "free" market; that is to say, at the premium price ruling over and above the fixed official price.

The liquid position of our company is distinctly more favourable than for some years past, and we can look forward with hope and confidence to the future.

The report and accounts were adopted.



TRADE WITH CANADA

Enquiries regarding Trade with Canada are warmly welcomed and should be addressed to:

LONDON, HOME COUNTIES,
SOUTH OF ENGLAND AND SCOTLAND

Commercial Secretary
Office of the High Commissioner for Canada
Canada House, Trafalgar Square, London, S.W.1

MIDLANDS, NORTH OF ENGLAND AND WALES
Canadian Government Trade Commissioner
Martins Bank Building, Water Street, Liverpool

NORTHERN IRELAND
Canadian Government Trade Commissioner
36 Victoria Square, Belfast

VISIT THE CANADIAN
INTERNATIONAL TRADE FAIR, TORONTO, 1952

HILGER & WATTS**WORLD MARKET FOR PRODUCTS**

The Fourth Annual General Meeting of Hilger and Watts Limited was held on March 20 in London, Mr. G. A. Whipple, M.A., M.I.E.E. (chairman and managing director), presiding.

The chairman, in the course of his speech, said: The accounts for the year ended Sept. 30, 1951, show an available surplus of £37,118, against £35,373 for the previous year. The trading surplus amounts to £162,006, against £145,528, or an increase of £16,478.

The directors again recommend a first and final dividend on the Ordinary shares of 7½ per cent less income tax.

Work on the new factory progresses steadily. Essential certificates have been granted for steel and other materials in short supply, but better progress might have been made had the weather been more favourable to the builders and other contractors. Our present plan provides for limited production in the new factory to commence in July and for the major move to take place later in the year. A contract to sell a part of the company's premises at Camberwell has been executed.

Difficult trading conditions persist but we are fortunate in that our products have a low raw material content with a high conversion value. They are therefore viewed with especial favour by the Board of Trade and other interested departments.

SCIENTIFIC EXPORTS

Our associate company, Scientific Exports, will shortly be sending three specially trained University graduates to strengthen their existing technical sales staff in Canada. North America is now our largest single market, and when I was there last autumn I formed the opinion that its capacity to take up our products is almost unlimited. Whilst still maintaining its export sales your company is nevertheless contributing to the rearmament programme.

The programmes of our Research and Development Departments have been kept constantly under review in the light of demands and reports from the various markets, with the result that our instruments continue to find favour throughout the world. Several very important new instruments have been put into production during the year; others are in course of development.

Great credit is due to our production staff in maintaining current output whilst planning and organising for the new factory; nevertheless, the coming months will be difficult.

The report was adopted.

ASHANTI GOLDFIELDS CORPORATION LTD.

NOTICE IS HEREBY GIVEN that the Board of Directors have to-day recommended a Final Dividend (No. 111) on the Issued Capital of the Corporation at the rate of 1s. per Unit of Stock, less Income Tax at 9s. 6d. in the £. This Dividend which is in respect of the year ended September 30, 1951, to be payable on and after May 22, 1952, to all Stockholders on the Registers on March 27, 1952.

The Transfer Books will be closed from March 28, 1952, to April 3, 1952, both dates inclusive, for the preparation of Dividend Lists.

By Order of the Board,

E. W. MORGAN,
Secretary.

Registered Address:
10, Old Jewry, London, E.C.2.
March 18, 1952.

BIBIANI (1927) LTD.

NOTICE IS HEREBY GIVEN that the Board of Directors have to-day recommended a Final Dividend (No. 29) on the Issued Capital of the Company at the rate of 6d. per Unit of Stock, less Income Tax at 9s. 6d. in the £. This Dividend which is in respect of the year ended September 30, 1951, to be payable on and after May 22, 1952, to all Stockholders on the Registers on March 27, 1952.

The Transfer Books will be closed from March 28, 1952, to April 3, 1952, both dates inclusive, for the preparation of Dividend Lists.

By Order of the Board,

E. W. MORGAN,
Secretary.

Registered Address:
10, Old Jewry, London, E.C.2.
March 18, 1952.

W. E. SINCLAIR, M.I.M.M.
Consulting Mining Engineer
South & East Africa & Rhodesia
P.O. Box 1183. JOHANNESBURG



The Trade Mark of
THE OAKLAND GROUP

OAKLAND METAL CO. LTD.

- Buyers & Sellers**
- Iron Ore
 - Lead Ore
 - Antimony Ore
 - Zinc Ore
 - Rutile
 - Graphite
 - Ilmenite
 - Sillimanite
 - Kyanite
 - Manganese Dioxide
 - Industrial and Laboratory Chemicals
 - Non-Ferrous Scrap and Residues
 - SPECIALITIES—Complex Residues and Ores containing Tin, Nickel, Cobalt, Tungsten, Cadmium, etc.

A.O. METAL EXPORTERS LTD.

- Shippers Exporters Importers**
- Pig Iron
 - Machinery
 - Cycles and Accessories
 - Hardware, Shoe Grindery
 - Ship's Tackle
 - Building Materials, Nails, Rivets, Tacks
 - STEEL, ALUMINIUM, COPPER, BRASS
 - & BRONZE in the following forms—
 - Sheets (Flat and Corrugated)
 - Angles, Joists
 - Rounds, Tees
 - Tubes, Strips

CEIRIOG METAL CO. LTD.

- Buyers**
- Aluminium Foil Scrap with Paper, etc.
 - Aluminium Scrap
 - Aluminium Dross
 - Aluminium Residues

All Offers and Enquiries to Administrative Offices—

**94 NEW BOND STREET,
LONDON, W.1**

Cables: AMOMET, LONDON Phone: GROsvener 3241-4

Metal Smelting and Refining Works:
OAKLAND WORKS, WILLINGTON, DERBYSHIRE

Aluminium Works:
**FELLINCERRIG FACTORY, MACHYNLETH,
MONTGOMERYSHIRE**

Metal and Mineral Trades

THE BRITISH METAL CORPORATION LIMITED

HEAD OFFICE
PRINCES HOUSE, 93 GRESHAM STREET, LONDON, E.C.2
Tel. Monarch 8055

AND AT
17 SUMMER ROW, BIRMINGHAM 47 WIND STREET, SWANSEA
Tel. Central 6441 Tel. Swansea 3166

OVERSEAS ASSOCIATES

THE BRITISH METAL CORPORATION
(AUSTRALIA) PTY., LIMITED
SYDNEY, PERTH AND MELBOURNE

THE BRITISH METAL CORPORATION
(CANADA) LIMITED
MONTREAL

DREW, BROWN LIMITED
MONTREAL AND TORONTO

THE BRITISH METAL CORPORATION
(INDIA) LIMITED
CALCUTTA AND BOMBAY

THE BRITISH METAL CORPORATION
(PAKISTAN) LIMITED
KARACHI

THE BRITISH METAL CORPORATION
(SOUTH AFRICA) (PROPRIETARY) LTD.
JOHANNESBURG

THE BRITISH METAL CORPORATION
(CENTRAL AFRICA) LIMITED
BULAWAYO

C. TENNANT, SONS AND CO.,
OF NEW YORK,
NEW YORK

CONSOLIDATED TIN SMELTERS, LIMITED.

ST. SWITHIN'S HOUSE, 11/12 ST. SWITHIN'S LANE, LONDON, E.C.4

Telephone: MANston House 2164/7

Telegrams: CONSMELTER, PHONE LONDON

PROPRIETORS OF THE FOLLOWING BRANDS OF LAMB & FLAG AND STRAITS TIN

ENGLISH
(COMMON & REFINED)

**CORNISH
MELLANEAR
PENPOL**

STRAITS E. S. COY., LTD., PENANG

BUYERS OF ALL CLASSES OF TIN ORES

Sole Selling Agents: VIVIAN, YOUNGER & BOND, LIMITED

8 BASINGHALL STREET, LONDON, E.C.2

Telephone: MONarch 7221/7

Established 1797

Members of the London Metal Exchange

DERBY & Co., Ltd.

Specialists in

WOLFRAM, SCHEELITE, CHROME, MOLYBDENITE, TANTALITE, COLUMBITE
RUTILE, ILMENITE, BERYL, ZIRCON AND OTHER MINERALS.

Smelters and Refiners of

GOLD, SILVER, PLATINUM, PALLADIUM, OSMIUM, IRIIDIUM, ETC.

Buyers of

MINERALS, ORES, CONCENTRATES, SWEEPS, LEMELS AND RESIDUES containing
GOLD, SILVER, PLATINUM, COPPER, TIN, ZINC, LEAD.

Smelting and Refining Works:
BRIMSDOWN, MIDDLESEX

City Office: 11-12 ST. SWITHIN'S LANE, E.C.4

Telephone: AVENUE 5272 (20 lines)

Also at **NEW YORK — ADELAIDE — JOHANNESBURG**

Cable Address: WAHCHANG, NEW YORK

WAH CHANG CORPORATION

(FORMERLY WAH CHANG TRADING CORPORATION)

233 BROADWAY

NEW YORK 7, NEW YORK

TUNGSTEN TIN

BUYERS

Tungsten Concentrates, Tungsten Tin Concentrates
Mixed Tungsten Ores
Tungsten Tailings, Scrap, Tips, Grindings
Tin Concentrates—Tin Dross, Tin Furnace Bottoms

SELLERS

Tungsten Concentrates to Buyers' Specifications
Tungsten Salts, Tungsten Powder
Tungsten Rods and Wires
Tin Ingots, Tin Oxides, Tin Chlorides

PLANT—GLEN COVE, NEW YORK

GEORGE T. HOLLOWAY

& CO. LTD.

METALLURGISTS & ASSAYERS,
ORE TESTING, WORKS AND
METALLURGICAL RESEARCH LABORATORIES

Atlas Road, Victoria Road, Acton,
LONDON N.W.10

Telephone No.:
ELGAR 5202

Tels. & Cables:
NEOLITHIC LONDON

Telegrams:
"BASSETT, PHONE, LONDON."

Telephone:
MANSION HOUSE 4401/3.

BASSETT SMITH & Co. Ltd.

(Incorporating George Smith & Son)

15/18 LIME ST., LONDON, E.C.3

METALS,

ORES (Copper, Zinc, Lead, &c., Complex),
RESIDUES, SKIMMINGS & ASHES
NON-FERROUS SCRAP

ESTABLISHED 1869

BLACKWELL'S
METALLURGICAL WORKS LTD.
THERMETAL HOUSE, GARSTON, LIVERPOOL 19

MAKERS OF
FERRO ALLOYS, NON-FERROUS ALLOYS
RARE METALS

BUYERS AND CONSUMERS OF
COLUMBITE TANTALITE, TUNGSTEN
MANGANESE and all ORES.

Works, Garston.

Telegrams: Blackwell, Liverpool

WOLFRAM ORE TIN ORE

FELIX KRAMARSKY CORPORATION

39 BROADWAY
NEW YORK 6, N.Y.

Cable Address: Orewolfram

ESSEX METALLURGICAL

(F. L. Jameson, A.M.I.M.M.)

Assayers and Samplers

Laboratories and Offices:

13 Woodhouse Grove, London, E.12

Telephone: GRAngewood 4364

Grams: Assaycury, Forgate, London Cables: Assaycury, London

THE ANGLO METAL COMPANY LIMITED

2 & 3, CROSBY SQUARE,
LONDON, E.C.3

(Members of the London Metal Exchange)

NON-FERROUS METALS
ORES & CONCENTRATES
BULLION

Telephone:
LONDON WALL 6341
(Private Branch Exchange)

Cables: NUCLIFORM, LONDON

Telegram: PHONE
LONDON

SHEARMAN & CO. LTD.

(Est. over 30 years)

BANK CHAMBERS, TAVISTOCK, DEVON

Telephone: TAVISTOCK 497

Cables: SHEARMAN, TAVISTOCK

U.K. Brokers for several Portuguese Mines and Refineries offering:

CASSITERITE, SCHEELITE, TIN INGOTS
WOLFRAM ORE, LEAD ORE, MERCURY.

Cape Town and Johannesburg Branches offer direct shipments of MANGANESE, IRON, CHROME, VERMICULITE, ASBESTOS, ANDALUSITE, MICA, now shipping to all destinations.

ENQUIRIES SOLICITED

EVERITT & Co. Ld.

40 CHAPEL STREET
LIVERPOOL

Tele. Address: Persistent, Liverpool

Phone: 2905 Central

SPECIALITY

MANGANESE PEROXIDE ORES,

We are buyers of:—

WOLFRAM, SCHEELITE, MOLYBDENITE
VANADIUM, ILMENITE, RUTILE,
ZIRCONIUM and TANTALITE ORES

Suppliers of:—

FERRO-ALLOYS & METALS NON-FERROUS ALLOYS

CUPELS

MAGNESIA CUPELS and ASSAY MATERIAL
"MABOR" BRAND, as supplied to MINTS,
MINES and ASSAYERS throughout the World.

MABOR (1944) LIMITED
(Founded 1900)

THE PIONEERS OF MAGNESIA CUPELS

Registered Office: 310 Winchester House, London, E.C.2

Phone: London Wall 5089 Tel. Address: Maborlim, London

Agencies: SALEM, INDIA: MONTREAL, CANADA:
PERTH, W.A.

Supplies through Agents, the Trade, or direct.

A. STRAUSS & CO. LTD.

FOUNDED 1875

PLANTATION HOUSE, MINING LANE, E.C.3

Telephone: Avenue 5851

MERCHANTS, EXPORTERS, IMPORTERS

NON-FERROUS METALS
SCRAP RESIDUES

METAL REFINERS

Members London Metal Exchange

METAL SUPPLIES *Ltd*

SUPPLIERS OF
BRASS RODS
BRASS SHEETS
NICKEL CHROME IRON WIRES
ZINC SHEETS
CADMIUM

AND ALL OTHER NON-FERROUS METALS

72 VICTORIA ST. LONDON S.W.1

'Phone: VICTORIA 1735 (3 lines).

'Grams: METASUPS, WESPHONE.

ILMENITE

10,000 TONS AVAILABLE NOW

TiO ₂	59.40%	Fe ₂ O ₃	27.00%
FeO	11.50%	Al ₂ O ₃	0.44%
SiO ₂	0.50%	CaO	0.05%
MgO	0.17%	MnO	0.31%

Bids to: SILTA, Corso Matteotti, 9, Milano, Cables: Siltam

MINING & CHEMICAL PRODUCTS, LTD.

MANFIELD HOUSE, 376, STRAND, W.C.2

Telephone: Temple Bar 6511/3
Telegram: "MINCHEPRO, LONDON"

Works: ALPERTON,
WEMBLEY, MIDDLESEX

Buyers of Silver Ores and Concentrates

Smelters and Refiners of

BISMUTH

ORES, RESIDUES & METAL

Manufacturers of:

FUSIBLE ALLOYS, SOLDER, WHITE METALS
ANODES OF TIN, CADMIUM AND ZINC IN
ALL SHAPES

Importers and Distributors of:

ARSENIC • BISMUTH • CADMIUM
INDIUM • SELENIUM • TELLURIUM
THALLIUM

METAL TRADERS LTD.

7 GRACECHURCH ST., LONDON, E.C.3

Telegrams:
Sarolatem, Stock, London

Telephone:
MANsion House 7275/6/7

*Buyers and Sellers of
NON-FERROUS METALS
ORES AND MINERALS*

New York Representative:

Metal Traders Inc., 67 Wall Street

BROOKSIDE METAL CO. LTD.

(Owned by Metal Traders Ltd.)

HONEYPOT LANE, STANMORE, MIDDX.

Telegrams:
Aluminium, Stanmore

Telephone:
EDGware 1646/7

*Buyers and Sellers of
ALL NON-FERROUS METALS*

Specialists in ALUMINIUM

Consult

JOHN DALE

LIMITED

*about Aluminium Alloy
Gravity Die Castings*

DEPT. V LONDON COLNEY, ST. ALBANS, HERTS
Telephone: Bonninggreen 2266

THE STRAITS TRADING COMPANY LIMITED

Head Office:

P.O. Box 700, OCEAN BUILDING, SINGAPORE

Works:

SINGAPORE & PENANG

"The Straits Trading Co., Ltd."
Brand of Straits Tin

THE BRITISH TIN SMELTING COMPANY, LIMITED

Works: LITHERLAND, LIVERPOOL

Smelters of Non-ferrous Residues and Scrap

London Agents:

W. E. MOULSDALE & CO., LTD.

2 Chantrey House, Eccleston Street, London, S.W.1
Cables: Wemoulanco, London Telephone: SLOane 7288/9

Telegrams:
NONFERMET
TELEX, LONDON

Cables:
NONFERMET
LONDON

Telephone:
MANsion HOUSE 4521
(10 lines)

HENRY GARDNER & CO. LTD.

*Non-Ferrous Metals
Ores, Minerals & Residues
Rubber
General Merchandise*

**2 METAL EXCHANGE BUILDINGS
LONDON, E.C.3**

and at BIRMINGHAM, MANCHESTER and GLASGOW

THE ANGLO CHEMICAL & ORE COMPANY LIMITED

PALMERSTON HOUSE, BISHOPSGATE, LONDON, E.C.2

Importers and Exporters MINERALS · ORES · RESIDUES · CHEMICALS · NON-FERROUS METALS & SCRAP

TELEPHONE: LONDON WALL 7255 (5 lines)

TELEGRAMS: CHEMORE

P. & W. MACLELLAN LTD.

129 TRONGATE, GLASGOW

NON-FERROUS METALS all classes
INGOT SCRAP MANUFACTURED

Letters: P.O. Box 95 Glasgow
Telegrams: Maclellan, Glasgow Telephone: Bell 3403 (20 lines)

RHONDDA METAL CO. LTD.

1 HAY HILL, BERKELEY SQ. LONDON, W.1

Works: PORTH, GLAM.

PHOSPHOR COPPER
PHOSPHOR BRONZE, LEAD BRONZE,
GUNMETAL, BRASS

Telephone: MAYFAIR 4654

Cables: RONDAMET

S. J. BARNETT & Co. Ltd.

DERBYSHIRE HOUSE,
BELGROVE STREET, LONDON, W.C.1
Telephone: Terminus 3154

ORES - METALS - RESIDUES

Gordon Simpson (Assayer) Ltd.

Consulting, analytical Chemists;
assayers, samplers, etc.

191 CLAPHAM ROAD, LONDON, S.W.9

Telephone: BRIXTON 1671

ALFRED HARRIS & Co. (Richmond) Ltd.

FOR ALL SCRAP METALS

Specialities:—

NICKEL MOLYBDENUM TUNGSTEN

MANOR PARK, RICHMOND, SURREY Phone: 0028/9

SILTA S.p.A.

MINERALS, METALS, FERRO-ALLOYS, ORES & CONCENTRATES

We Buy:

Tantalite Ores. Tantalum, Niobium Ores, Tantaliferous Slags

MILANO, Corso Matteotti, 9

Cables: SILTAM, MILAN

Phones: 7006/96 / 7017/15

WANTED by METALLO

ALL NON-FERROUS

ORES · RESIDUES · MATTES · TAILINGS
SLAGS · BY-PRODUCTS · SCRAP METALS

BUYERS & REFINERS

Exporters of Non-Ferrous Virgin Metals & Chemicals for the Mining Industry.

METALLO CHEMICAL REFINING CO., LTD.

BALTIC HOUSE, LEADENHALL STREET, LONDON, E.C.3.

Telephone: ROYAL 5611/7

Telegrams: METALREFIN, TELEX, LONDON

Foreign Telegrams: METALREFIN, LONDON

Teletprinter: United Kingdom—ROYAL 1019

Continental—LONDON, TELEX 9142

Associated Companies in New York

Brussels

Amsterdam

Milan

Tel-Aviv

Agents all over the World.

FOR

COLLIERY ARCHES

of the following types: SPLAYED LEG, HORSE SHOE, STRAIGHT AND SPECIAL LEG Complete with FISHPLATES, RAINE'S PATENT CORRUGATED TYPE FISHPLATES, also PLAIN AND CHANNEL SECTIONS.

IRON & STEEL SECTIONS

ROUNDS, SQUARES, FLATS, ANGLES, CONVEX, CHANNELS, HEXAGONS, TEES, FISHBARS, RIVET BARS, ONE AND TWO ROUND EDGE, FUNNEL, TAPER AND CLIP BARS, ETC.

LIGHT RAILS

FLANGE, BRIDGE and ACCESSORIES

**CORRUGATED
ROOFING STRAPS,
STEEL SLEEPERS**


RAINE
AND COMPANY LIMITED

IRON & STEEL MANUFACTURERS
GRAINGER HOUSE, BLACKETT STREET
NEWCASTLE UPON TYNE, I

Telephone NEWCASTLE 44 141 and 44 142 Telegrams RAINE NEWCASTLE/TYNE

**CONTRACTORS TO THE WAR OFFICE AND ADMIRALTY
ON LLOYD'S, BOARD OF TRADE, BUREAU VERITAS AND OTHER LISTS**